# TWEED RIVER ENTRANCE SAND BYPASSING PROJECT: PERMANENT BYPASSING SYSTEM

*Director-General's Report*
*Section 115C*
*of the Environmental*
*Planning and Assessment Act*

*June 1998*

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# FOREWORD

The Minister for Land and Water Conservation is proposing to undertake a permanent sand bypassing operation at the entrance of the Tweed River on the NSW North Coast. The proposal, which is being undertaken in conjunction with the Queensland Minister for the Environment, aims to provide a safe navigable entrance to the Tweed River and ensure continuous supply of sand to the southern Gold Coast beaches to enhance beach amenity. The *Tweed River Entrance Sand Bypassing (TRESB) Act, 1995* was made to ratify a Deed of Agreement between the two states to undertake the project. The permanent sand bypassing system represents the second stage of the works covered by the TRESB Act, the first stage comprising a dredging campaign which is now largely completed.

Under the provisions of the TRESB Act, the proposal is subject to assessment under Division 4, Part 5 of the *Environmental Planning and Assessment (EP&A) Act, 1979*. As such, the Minister for Urban Affairs and Planning's approval is required for the works.

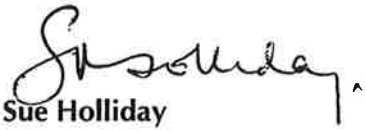
The Minister for Land and Water Conservation (the proponent) has sought approval for the proposal from the Minister for Urban Affairs and Planning under Section 115B of the Environmental Planning and Assessment (EP&A) Act 1979.

This report has been prepared in accordance with Section 115C of the EP&A Act which requires that the Minister obtains a report from the Director-General of the Department of Urban Affairs and Planning prior to making a decision.

The purpose of this report is to review the Environmental Impact Statement (EIS), issues made in representations in response to its exhibition, further information provided by the proponent and other relevant matters pertaining to the potential environmental impacts of the proposal. The report documents the outcome of an independent assessment of the proposal and concludes that the potential environmental impacts associated with the project can be mitigated by adopting management measures referred to in this report and the recommended conditions of approval. On that basis, it is recommended that the proposal be approved subject to the recommended conditions.

The EIS for this project adopted a different approach to other EISs in that it assessed the environmental impacts of a range of options and sought approval for each of these options. This approach was apparently adopted to secure maximum flexibility at the tendering stage.

A more appropriate approach would have been to undertake an environmental assessment of alternative options at a strategic level. The EIS could then focus on a specific option within that strategic context. The Department advocates this alternative approach for future similar situations.



**Sue Holliday**
Director-General
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# Glossary and Abbreviations

| | |
|---|---|
| **accretion** | Accumulation of sand on a beach or shoal; opposite to erosion. |
| **ASS** | acid sulphate soils |
| **bathymetry** | Commonly used as a term for the topography of the ocean bed. |
| **beach nourishment** | The placement of sediment by mechanical means to supplement the sand reserve on an existing beach or to build up an eroded beach. |
| **benthic** | Relating to animals or plants that exist on or beneath ocean or estuary floors. |
| **breakwater** | Structure protecting a shoreline, harbour, anchorage or basin from ocean waves. |
| **DLWC** | Department of Land and Water Conservation |
| **downdrift** | The direction of predominant movement of littoral sediments along the coast in reference to the direction of net longshore transport ie. direction along a shoreline to which most of the sediment moves from a particular location. |
| **DUAP** | Department of Urban Affairs and Planning (the Department) |
| **ebb tide** | The outflow of coastal waters from bays and estuaries caused by the falling tide. |
| **EIS** | Environmental Impact Statement |
| **ENCM** | Environmental Noise Control Manual |
| **entrance bar** | Accumulation of sand in a mound formation at the mouth of a river. |
| **EP&A Act** | Environmental Planning and Assessment Act, 1979 |
| **groyne** | A shore protection structure built to trap littoral drift or prevent erosion of the shore. |
| **Indian Spring Low Water (ISLW)** | The approximate level of the mean of lower low waters during spring tides at a given location. |
| **littoral drift** | The sedimentary material moved in the littoral zone under the influence of waves and currents. |
| **littoral transport** | The movement of littoral drift in the littoral zone by waves and currents. Includes movement parallel (longshore transport) and perpendicular (onshore/offshore transport) to the shore. |
| **nearshore zone** | Coastal waters between the offshore bar and the 60m depth contour. Swell waves in the nearshore zone are unbroken, but their behaviour is influenced by the presence of the seabed. |
| **net longshore transport** | Net amount of beach material moving alongshore past a particular point on a shoreline in the predominant direction of transport. Typically expressed as an annual rate. |
| **NPWS** | National Parks and Wildlife Service |
| **QDE** | Queensland Department of the Environment |
| **sand bypassing** | Hydraulic or mechanical movement of sand from the accreting updrift side to the eroding downdrift side of an inlet or harbour entrance. |

| | |
|---|---|
| **subaerial** | Onshore portion of the active beach profile. |
| **subaqueous** | Nearshore portion of the active beach profile. |
| **TRESB Act** | Tweed River Entrance Sand Bypassing Act, 1995 |
| **TSC Act** | Threatened Species Conservation Act, 1995 |
| **updrift** | The opposing direction to the predominant direction of movement of littoral sediments along a shoreline ie. the direction along a shoreline from which most of the sediment arrives at a particular location. |

# EXECUTIVE SUMMARY

## The Proposal

The Minister for Land and Water Conservation, in conjunction with the Queensland Minister for the Environment, is proposing to implement a permanent sand bypassing system at the entrance of the Tweed River on the NSW north coast (refer Figure S.1). The proposal aims to replicate the natural movement of sand along the coast and in so doing fulfil the following objectives:

- ensure a continuous supply of sand to the southern Gold Coast beaches and thereby enhance recreational amenity of these locations
- maintain a safe and navigable entrance to the Tweed River

The Environmental Impact Statement (EIS) for the proposal identified a range of options that would fulfil the project objectives and undertook assessment of all the options without selecting a preferred system. This approach was taken to allow the proponents maximum flexibility during the tender selection phase for the project. The bypass systems identified in the EIS can be categorised as follows:

- *Over the Water Mobile Systems*: which involve the use of water based dredging vessels which retrieve sand from the river entrance bar and deposit it at selected discharge locations.
- *Fixed Systems in the Nearshore Zone*: which involve fixing dredging equipment to the southern breakwater or a purpose built jetty structure and transfer of material via an onshore pipeline to selected discharge locations.
- *Onshore Based Mobile Systems*: which involve the use of customised land based plant which retrieve material from the South Head Beach area and transfer it to the selected discharge locations by means of an onshore pipeline.
- *Other Systems*: A range of other technologies and/or combinations of the above systems were also proposed as being suitable.

The primary material retrieval areas would depend on the nature of the system selected. The primary discharge area would be at Snapper Rocks with secondary discharges located at Kirra and Duranbah Beach.

Ancillary infrastructure would also be required for the construction and operation phases. The extent and location of this infrastructure would depend upon the nature of the bypass system selected.

An agreement between the two states to undertake the works is ratified in the Tweed River Entrance Sand Bypassing (TRESB) Act 1995.

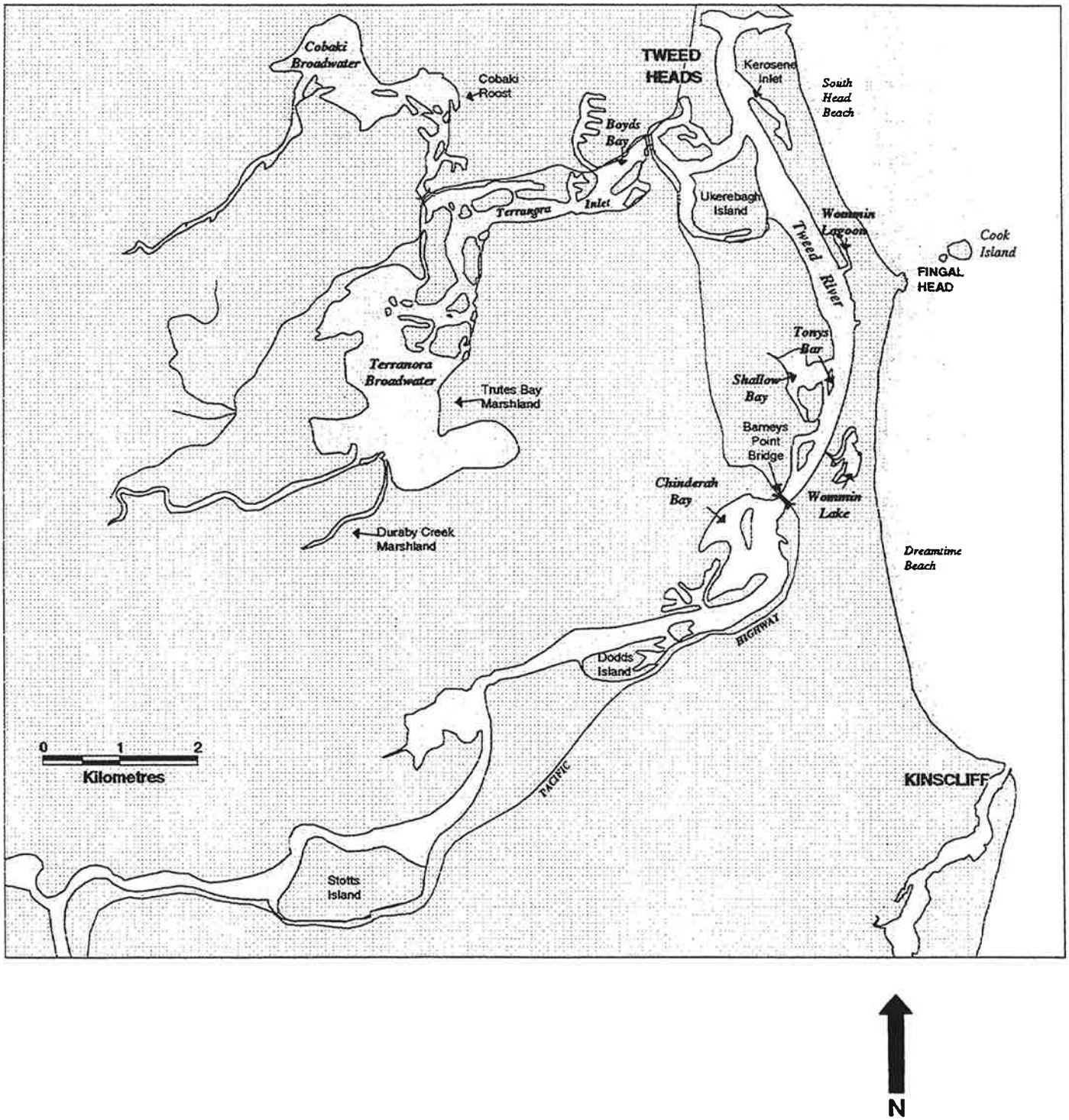



***FIGURE S.1***
*TWEED ESTUARY*
*(Source: Hyder Consulting et al, 1997)*

## EIS Exhibition and Approval Process

The EIS was exhibited from 14 July to 12 August 1997. A total of 30 representations were received as a result of the exhibition.

Key issues that were raised in the representations included the following:

- impacts of the proposal on flora and fauna within the study area including the Little Tern which is a threatened species under the *Threatened Species Conservation Act (TSC)1995* and which has an important roosting area within the study area at South Head Beach;
- impact on surf quality particularly with regard to maintenance of conditions at Duranbah Beach and the need for ongoing monitoring and management;
- impact on sites of Aboriginal archaeological and anthropological significance;
- impacts on the socio-economic environment including tourism and recreation and commercial fisheries and boating; and
- importance of maintaining a safe and navigable entrance to the Tweed River.

Under the TRESB Act, the proposed works are to be assessed under Part 5 of the EP&A Act. As such, approval was sought by the Minister for Land and Water Conservation from the Minister for Urban Affairs and Planning in accordance with Division 4 of Part 5 of the EP&A Act on 8 January 1998.

## Summary of Key Findings

*Flora and Fauna*

A detailed assessment was undertaken by the Department of the flora and fauna assessment included in the EIS, a supplementary report contained in the Representations Report and additional information submitted by the proponent. Potential impacts of the proposal were identified as resulting from changes to beach morphology at South Head Beach, provision of infrastructure at South Head Beach and Letitia Spit and changes to tidal ranges within the Lower Tweed Estuary.

The assessment indicated that a number of species listed under the TSC Act had the potential to occur within the study area. In particular, South Head Beach is an important habitat area for resident and migratory wading birds. In accordance with Section 5A of the Environmental Planning and Assessment Act, 1979, eight part tests were undertaken for a range of threatened avifauna and terrestrial fauna species which would have the potential to be impacted by the proposal. The assessment undertaken by the proponent concluded that the proposed works, which incorporated a range of management measures relating to the different bypass systems, would not have a significant effect on any threatened species.

As a result of its review of the proponent's assessment, the Department agreed with this conclusion. A range of conditions relating to flora and fauna have been included in the Recommended Conditions of Approval, to ensure that the commitments made by the proponent in relation to management of flora and fauna issues are implemented during

construction and operation of the bypassing works.

*Surf Quality at Duranbah*

The proposal would have the potential to have significant adverse impacts on surf quality and consistency at Duranbah Beach which is recognised as one of the best surfing beaches in the region. The bypassing project would affect the formation of the off-shore shoals in this location which are responsible for the existing surfing conditions. The degradation of surfing conditions at this location would represent a local adverse impact. However, in terms of the overall benefits expected to accrue throughout the region as a result of the proposal, the Department considers that this impact does not represent an impediment to undertaking the works.

The Department considers that a comprehensive surf management strategy should be developed and implemented in conjunction with the local surfing community, which has had a long involvement in this project, to minimise the impacts at Duranbah. The Strategy which will form part of the overall Sand Retrieval and Discharge Strategy to be developed as part of the proposal, will focus on flexibility in terms of discharge locations and volumes.

*Indigenous Heritage*

Subsequent to the EIS, the proponent undertook a supplementary indigenous heritage assessment which identified three locations of significance to the local Aboriginal community in terms of their scientific and anthropological characteristics. The proposed works would avoid these locations. Consultation with the local Aboriginal community would be ongoing throughout selection of a preferred system and implementation of the works. The Department is satisfied that the proposed works would not have a significant effect on indigenous heritage within the study area.

*Other Issues*

Other issues which were considered in the assessment included non-indigenous heritage impacts in terms of historic shipwreck sites, water quality impacts, noise and vibration impacts and impacts of construction and operation traffic. A range of conditions have been developed to ensure these impacts are mitigated to an acceptable level. The focus of these conditions has been on the development of a range of management strategies to be included as part of the Environmental Management Plan (EMP) for the project following selection of a preferred bypass system.

**Justification for the Proposal**

The TRESB Act sets the framework within which the bypassing system is being proposed including the need and justification for the works. The Act states that the project is needed to restore a safe and navigable entrance to the Tweed River and enhance the amenity of the southern Gold Coast beaches in perpetuity.

The justification for the project and the worth of the benefits that are expected to accrue have been ratified by the NSW Government in the making of the legislation. The Department considers that the subject proposal is in keeping with the intent of this legislation. Therefore the focus of this report will not be to reassess the justification for the proposed works, but rather, to undertake an assessment of the environmental impacts of the works to ensure that the subject proposal can be undertaken in an environmentally acceptable manner.

In its assessment of the proposed works, the Department has concluded that the benefits expected to accrue to the regional fishing industry may be limited. However, the local fishing industry would experience significant impacts if the proposal were not to proceed. In addition, the extent of benefits to the southern Gold Coast beaches is difficult to predict at this time because of the uncertainty of the effectiveness of the bypass system and a comprehensive program of monitoring and possibly refinement of the scheme will be required during operation to ensure the project objectives are realised.

**Conclusions and Recommendations**

The Department has undertaken an assessment of the proposal as described in the EIS and further information provided by the proponent in the Representations Report and supplementary information. The Department considers that provided the range of mitigation measures contained in the EIS, Representations Report and this assessment report are implemented, the impacts of the proposal will be able to be managed to an acceptable level. The Recommended Conditions of Approval contained in Section 9 of this report reflect the management measures that are required to be implemented during construction and operation of the proposed works.

# 1. INTRODUCTION

## 1.1 Nature of the Proposal

The Minister for Land and Water Conservation in conjunction with the Queensland Minister for the Environment is proposing to implement a permanent sand bypassing system at the entrance of the Tweed River in northern NSW (refer Figure 1.1).

The proposal is designed to replicate the natural processes associated with the littoral drift of sand along the eastern coast of Australia and in so doing, fulfil the following objectives:

- restore the amenity of the southern Gold Coast beaches; and
- maintain a safe and navigable entrance to the Tweed River

Figure 1.2 provides a schematic illustration of the existing coastal and estuarine processes in the study area, while Figure 1.3 provides a schematic illustration of the expected coastal and estuarine processes following implementation of the bypass system.

The proposed works form the second part of a two stage process which commenced in 1994 with the dredging of 2 million cubic metres of sand from the Tweed River entrance bar and associated nourishment of southern Gold Coast beaches.

In developing a system that would fulfil the project objectives, the proponent has identified a range of options that could be implemented alone or in combined form. The assessment of the proposed works considers all of the options identified and does not seek to identify a preferred option. A preferred bypass system would be selected by the proponent following assessment of tenders received from contractors.

## 1.2 Background and History

On a natural coast, littoral drift of sand occurs due to the process of wave and ocean current action. The Tweed River training walls, which were constructed and subsequently extended to improve navigability of the Tweed River entrance, act as a barrier to the natural movement of sand along the coast. As such, accretion of sand is occurring at the southern training wall and at the river entrance bar. In addition, the southern Gold Coast beaches downdrift of the training walls are not receiving a full natural supply of sand.

The disruption to natural processes is leading to a degradation of navigation conditions at the river entrance and is adversely affecting beach amenity.

Since the 1970's periodic sand dredging has been undertaken to improve navigability at the river entrance and undertake sand nourishment of the southern Gold Coast beaches.

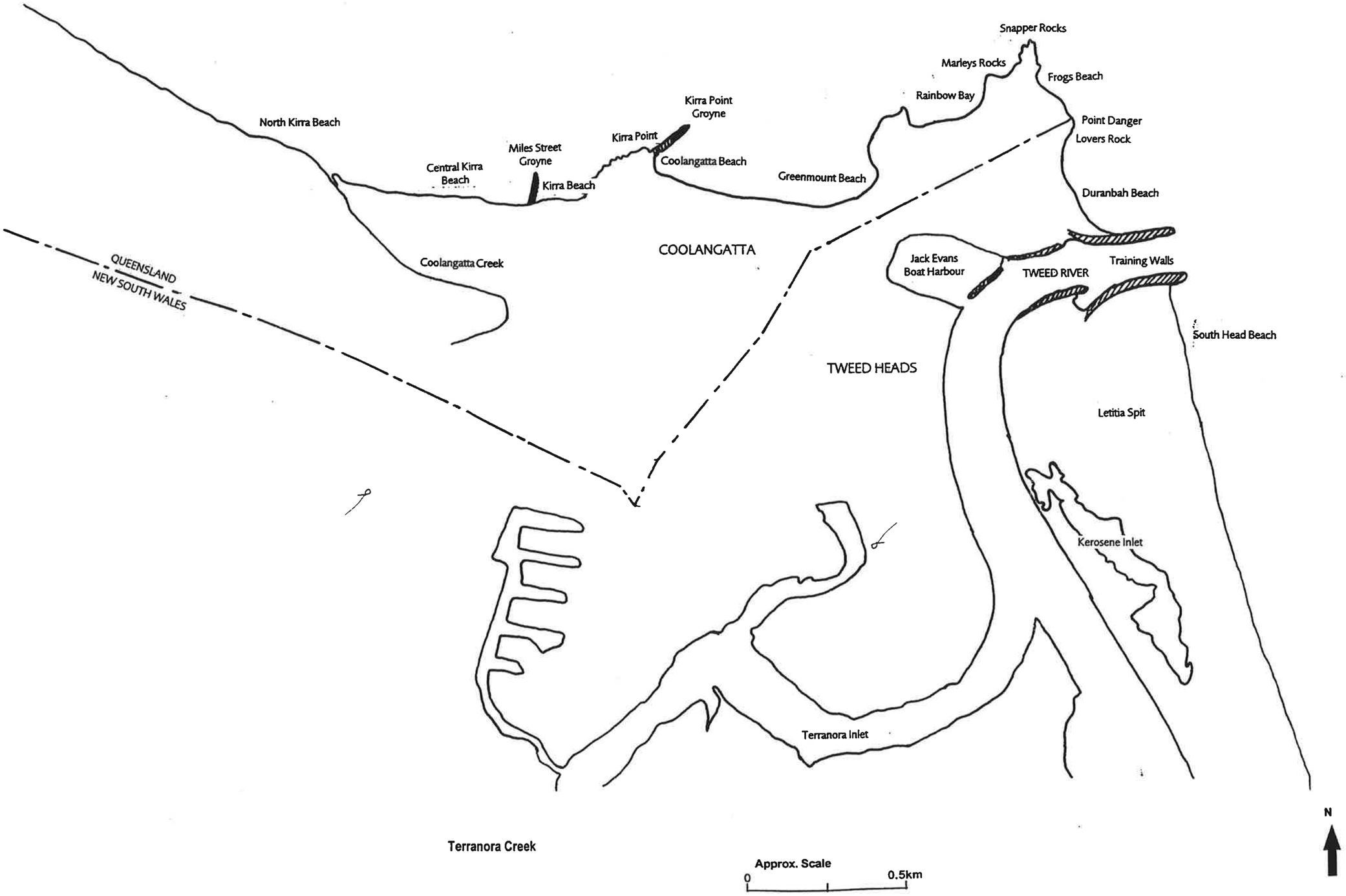



***FIGURE 1.1***
*STUDY AREA*
*(Source: Hyder Consulting et al, 1997)*

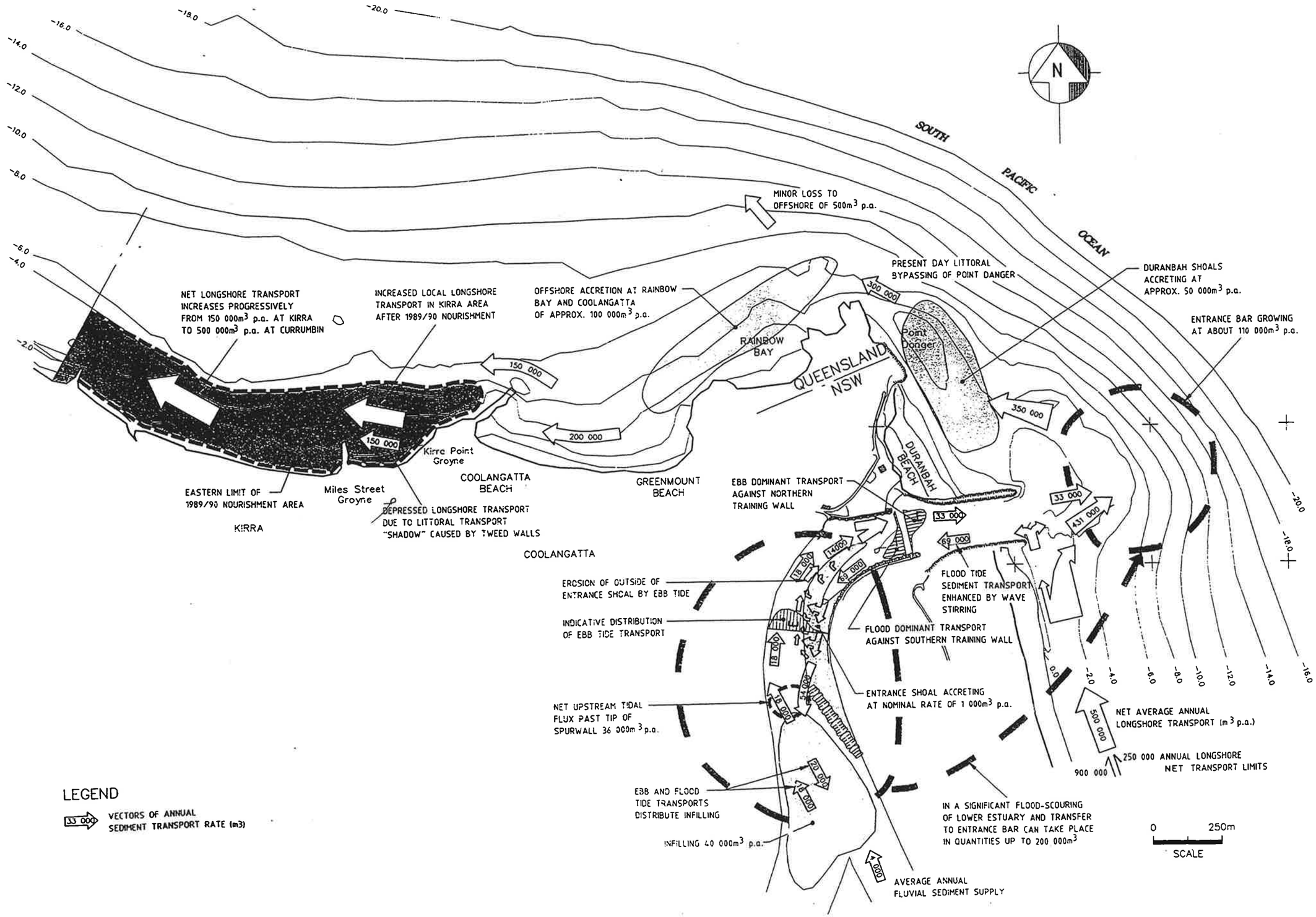
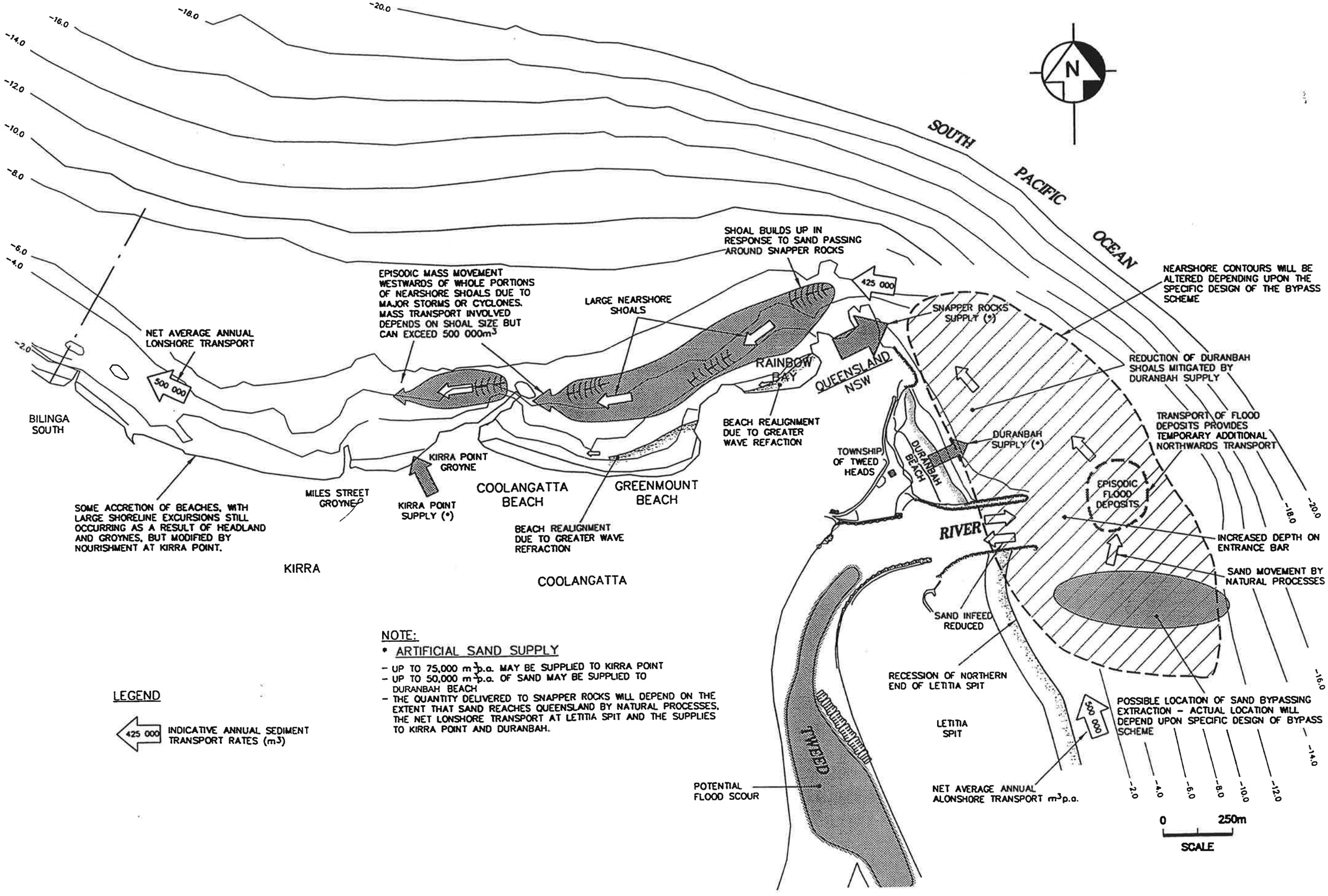



***FIGURE 1.2***
*SCHEMATIC ILLUSTRATION OF EXISTING COASTAL AND ESTUARINE PROCESSES*
*(Source: Hyder Consulting et al, 1997)*




NOTE:

* ARTIFICIAL SAND SUPPLY

- UP TO 75,000 $m^3$p.a. MAY BE SUPPLIED TO KIRRA POINT
- UP TO 50,000 $m^3$p.a. OF SAND MAY BE SUPPLIED TO DURANBAH BEACH
- THE QUANTITY DELIVERED TO SNAPPER ROCKS WILL DEPEND ON THE EXTENT THAT SAND REACHES QUEENSLAND BY NATURAL PROCESSES. THE NET LONSHORE TRANSPORT AT LETITIA SPIT AND THE SUPPLIES TO KIRRA POINT AND DURANBAH.

LEGEND

425 000 INDICATIVE ANNUAL SEDIMENT TRANSPORT RATES ($m^3$)

***FIGURE 1.3***

*SCHEMATIC ILLUSTRATION OF EXPECTED COASTAL AND ESTUARINE PROCESSES FOLLOWING BYPASS SYSTEM IMPLEMENTATION*

*(Source: Hyder Consulting et al, 1997)*

In 1995, the *Tweed River Entrance Sand Bypassing (TRESB) Act 1995* was passed to provide a permanent solution to the problems. The TRESB Act ratified a Deed of Agreement between the NSW and Queensland governments to undertake the following works:

- Stage 1: initial dredging of the Tweed River entrance bar and entrance area and the replenishment of the southern Gold Coast beaches
- Stage 2: artificial sand bypassing system to operate in perpetuity

The Stage 1 works were the subject of a separate environmental impact assessment undertaken in 1994. These works are currently nearing completion. The Stage 2 works are the subject of the current assessment.

### 1.3 Statutory Provisions and Assessment Process

The proposal involves works within both NSW and Queensland and as such is being assessed under the relevant legislation of each State. An Environmental Impact Statement/ Impact Assessment Statement (EIS/IAS) was prepared for the works (Hyder Consulting et. al., 1997).

This report is concerned with the works that are to be undertaken within NSW. A separate assessment is being undertaken by Queensland Department of the Environment (QDE) for those works to be undertaken in Queensland. Liaison between the Department of Urban Affairs and Planning (the Department) and QDE has been ongoing to ensure consistency in the recommendations of the respective reports.

Under Sections 102 (2) and (3) of the TRESB Act, the proposal is subject to assessment under Part 5 of the Environmental Planning and Assessment (EP&A) Act. Under Section 115A of the EP&A Act, the approval of the Minister for Urban Affairs and Planning (the Minister) must be obtained for the proposal.

### 1.4 Request for Approval of the Minister for Urban Affairs and Planning

The Minister of Land and Water Conservation sought the approval of the Minister by way of letter dated 8 January 1998. The request included associated supporting material which outlined a range of additional management measures to be implemented as part of the proposal.

### 1.5 Purpose of this Report

The purpose of this report is to review the Environmental Impact Statement (EIS), the issues raised in representations made in response to its exhibition, submissions made by the proponent and other matters pertinent to the potential environmental impact of the proposal.

This report has been prepared in accordance with Section 115C of the EP&A Act, which requires the Director-General of the Department of Urban Affairs and Planning (the Director-General) to assess and report to the Minister on the proposal. The report documents the outcome of an independent environmental impact assessment by the Department, accounting for all issues raised in representations to the EIS.

# 2. THE PROPOSAL AS DESCRIBED IN THE EIS

*This section of the report provides a description of the project as described in the EIS. The purpose is to provide an overview of the information presented in the EIS and does not necessarily represent the views of the Department. The Department's consideration of the proposal is provided in Sections 6 & 7.*

## 2.1 Introduction

The EIS for the proposal undertook an assessment of a range of options that would fulfil the defined project objectives. The options were based on an examination of current best-practice technology from other bypassing systems and the requirements for the bypass system outlined in the Deed of Agreement for the project. The EIS did not aim to select a preferred option, but rather assess the impacts of a range of options so that implementation of the proposal could be undertaken with maximum flexibility.

## 2.2 Deed of Agreement

The specific objectives of the proposal as contained in the Deed of Agreement are as follows for the two states:

- New South Wales: To establish and maintain a navigable depth of water of at least 3.5m below Indian Spring Low Water (ISLW) in the approach to and within the entrance channel of the Tweed River over a width equal to that between the rubble mound breakwaters.
- Queensland: To achieve a continuing supply of sand to the southern Gold Coast beaches at a rate consistent with littoral drift rates updrift and downdrift of those beaches, together with the supply of such additional sand to the beaches as is required to restore the recreational amenity of the beaches and maintain it.

The following parameters for the bypass system are defined in the Deed of Agreement:

- the purpose of the bypass system is to facilitate the natural littoral sand movement processes and to ensure the quantity of sand delivered matches the long term average net littoral transport taking into account the natural sand transport variations;
- the bypass system is required to deliver the majority of sand to Snapper Rocks, a proportion (10%) to Duranbah Beach and a quantity as required to Kirra Point;
- the annual average net littoral transport rate is considered to be 500,000$m^3$, however in the first five years of operation of the system, an additional amount of sand will be delivered to Queensland to take account of the ongoing sand accumulation prior to bypass operation; and
- allowance must be made within the system for sand which is not captured by the bypass before it reaches the Tweed River entrance or which is lost from the natural system before it reaches the beaches.

The areas for material retrieval and placement are also defined in the Deed of Agreement for the proposal.

## 2.3 Bypass Systems

The EIS identifies a number of bypass systems that may be suitable for fulfilling the project objectives. As discussed above, the EIS does not aim to select a preferred system, but rather, assesses the impacts of all identified feasible systems and combinations thereof. The main categories of bypass systems are as follows:

- over the water mobile systems;
- fixed systems in the nearshore zone;
- onshore based mobile systems; and
- other systems.

Within each of these categories, there are a number of options for the elements of material retrieval, material transfer and material placement which are discussed in the following section. Figure 2.1 illustrates the extent of the proposed works for the bypass system and Figure 2.2 provides a schematic illustration of the key bypass elements.

The EIS indicated that it may be desirable to use two or more of the systems in combination to achieve the most effective outcome. The following is a summary of key factors that will affect the development of bypass system combinations:

- It is likely that the bypass system would comprise either a mobile system or a combined fixed system and mobile system. The proponent has indicated that studies undertaken to date indicate that adoption of a fixed system alone may not ensure maintenance of a clear navigation channel.
- Cutter suction dredger systems would not be used as the sole equipment because of their limited range in storm conditions.
- Mobile water based systems may be required to be used at various times with all of the other categories of systems because of the probable need to undertake supplementary dredging following storm or flood events.
- A combination of onshore and offshore placement methods may be required to ensure full nourishment of the beach profile.

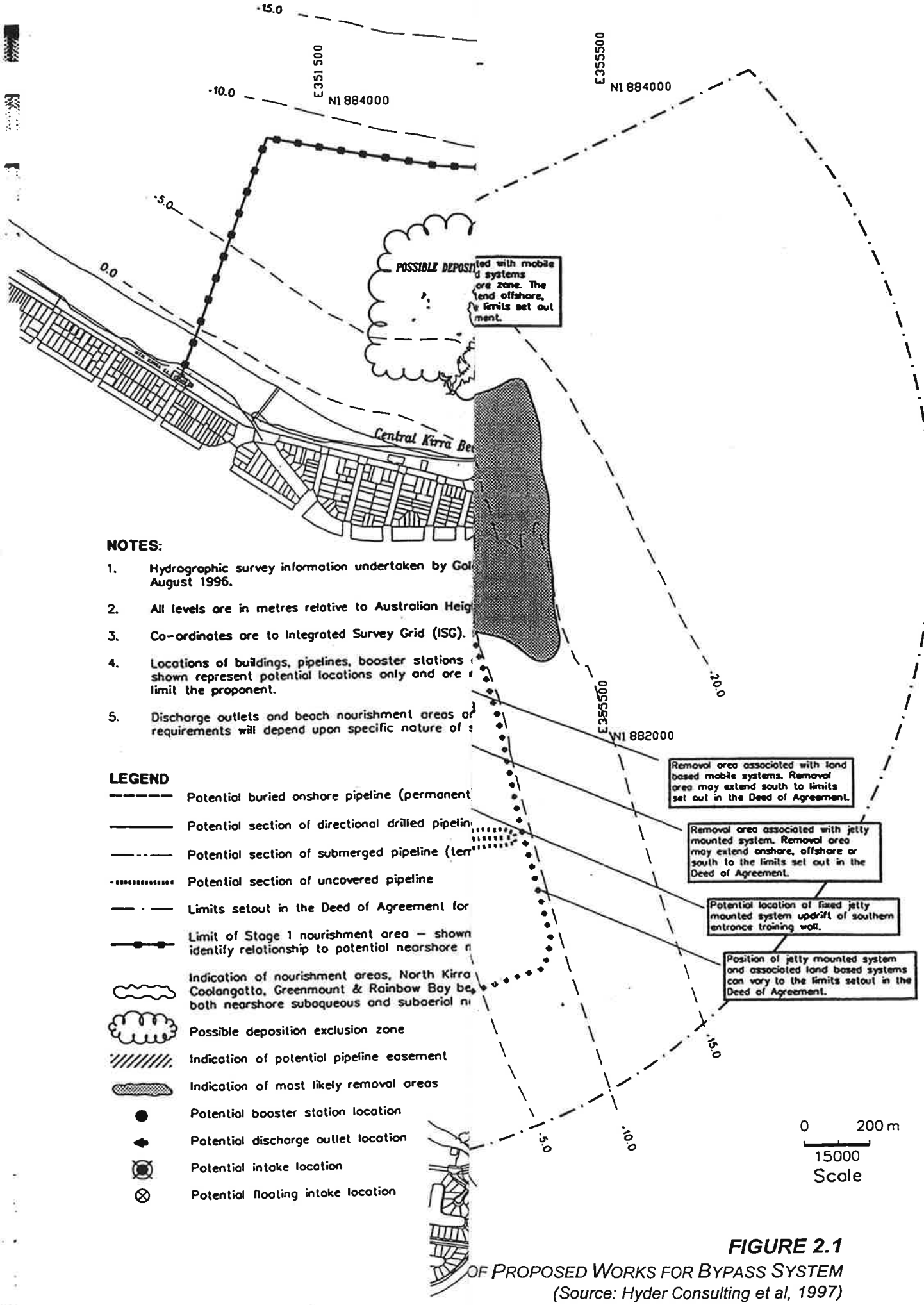
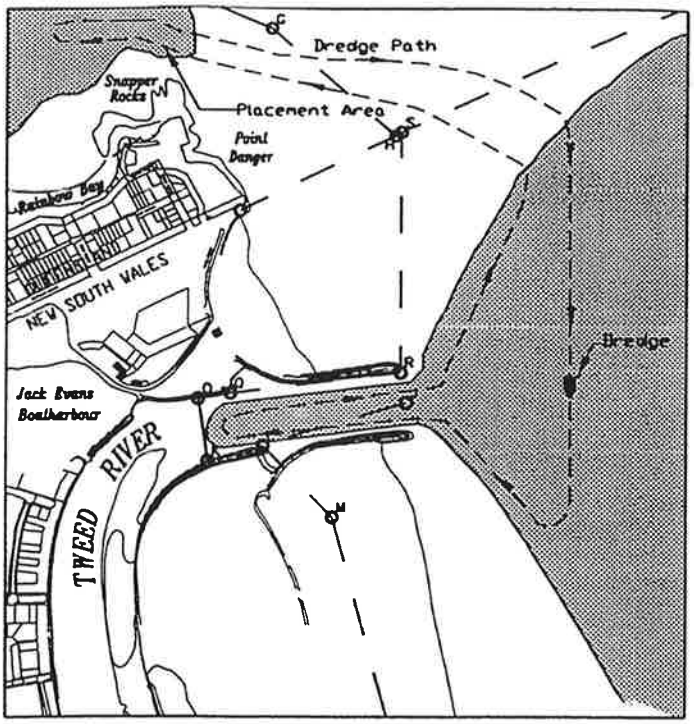


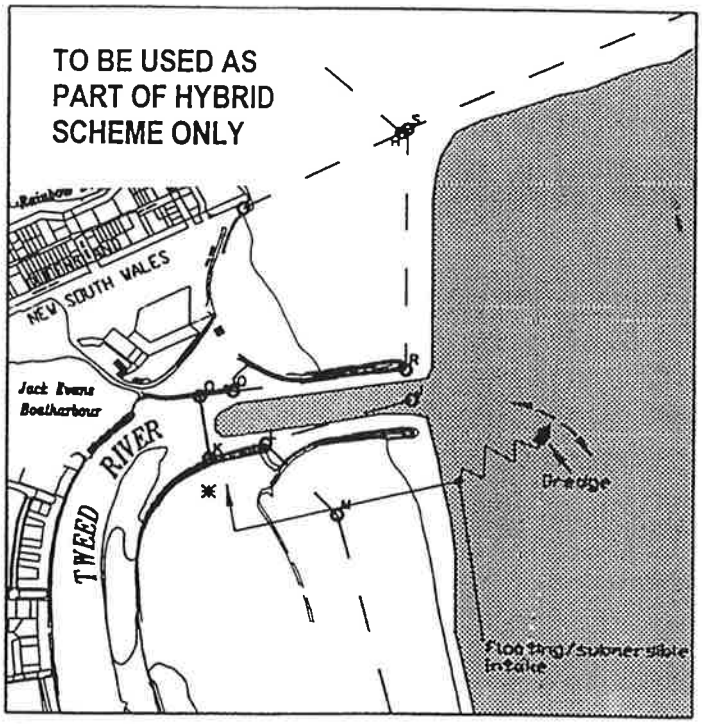

***FIGURE 2.1***

*OF PROPOSED WORKS FOR BYPASS SYSTEM*

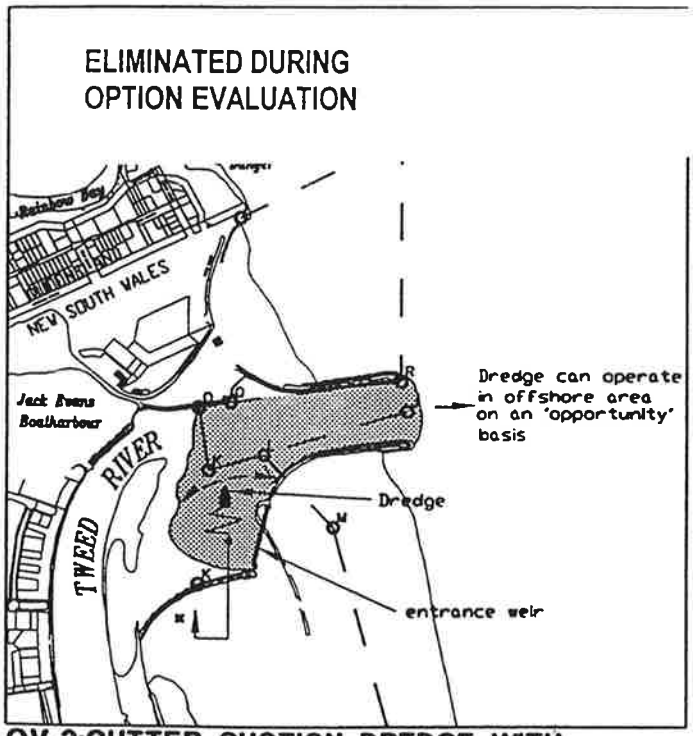
*(Source: Hyder Consulting et al, 1997)*



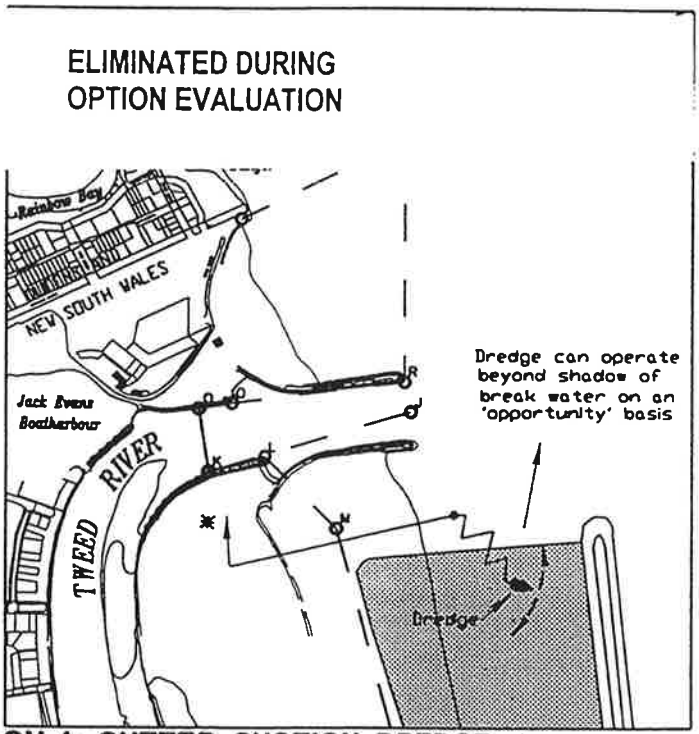

**OV- 1: TRAILING SUCTION HOPPER DREDGE**




**OV-2: CUTTER SUCTION DREDGE**




**OV-3:CUTTER SUCTION DREDGE WITH AN ENTRANCE WEIR**

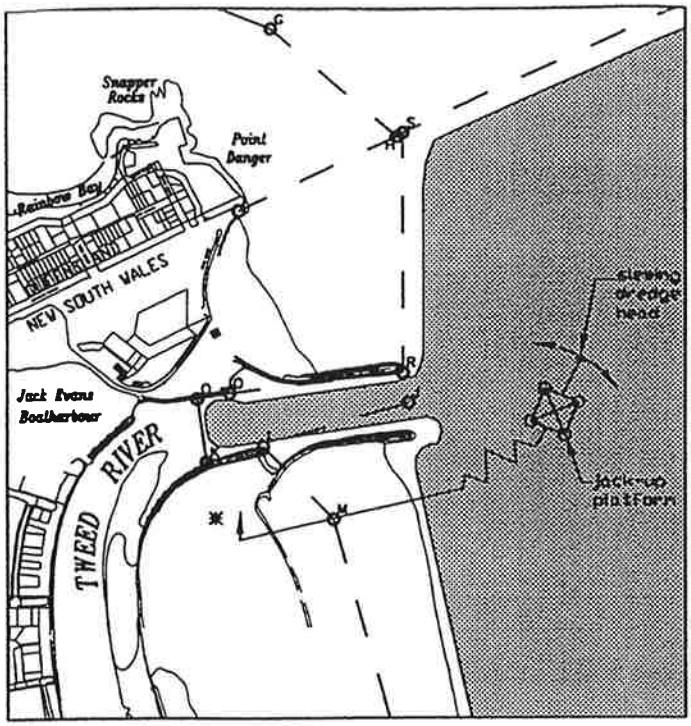



**OV-4: CUTTER SUCTION DREDGE WITH AN OFFSHORE BREAKWATER**

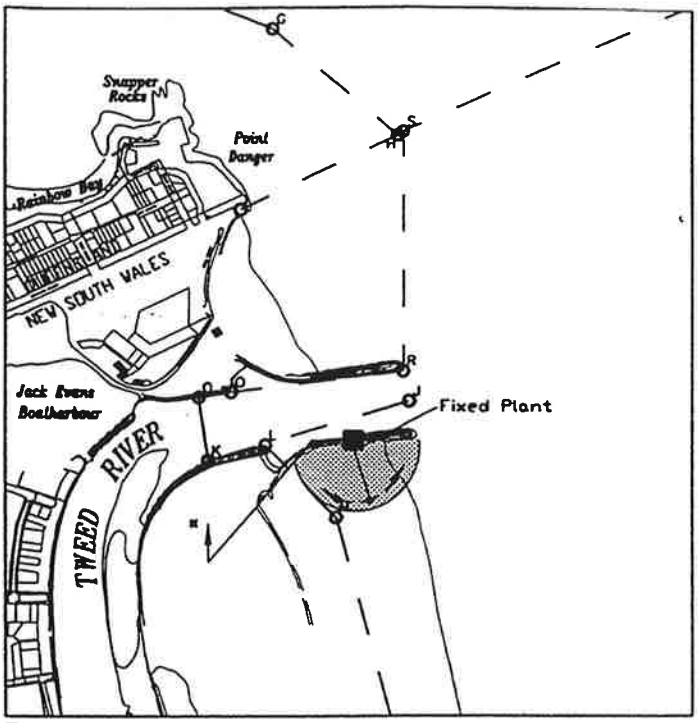
**LEGEND**
- **Potential primary removal area**
- **Flexible floating pipline**
- **Submerged pipeline**
- **Transportation to placement area (details not shown)**

0 400m
Scale

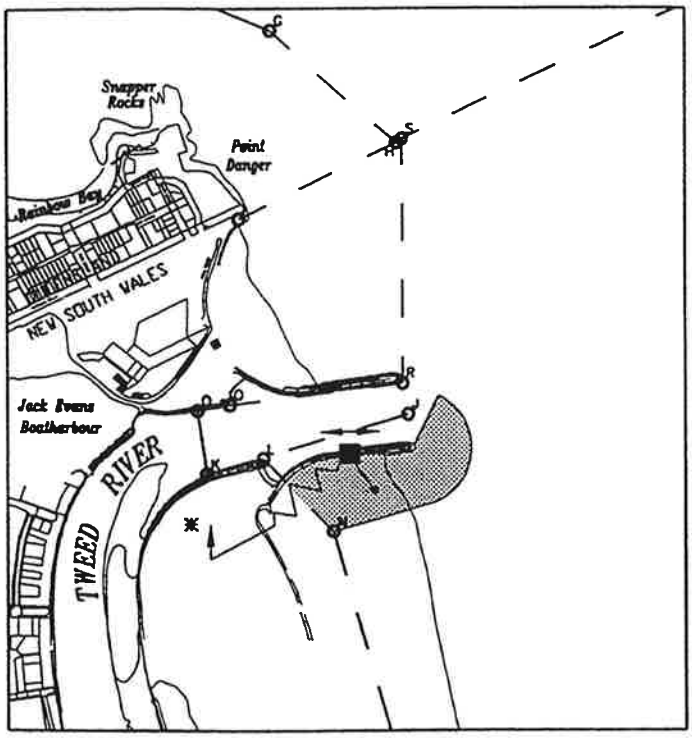
***FIGURE 2.2***
*BYPASS SYSTEM ELEMENTS*
*(Source: Hyder Consulting et al, 1997)*



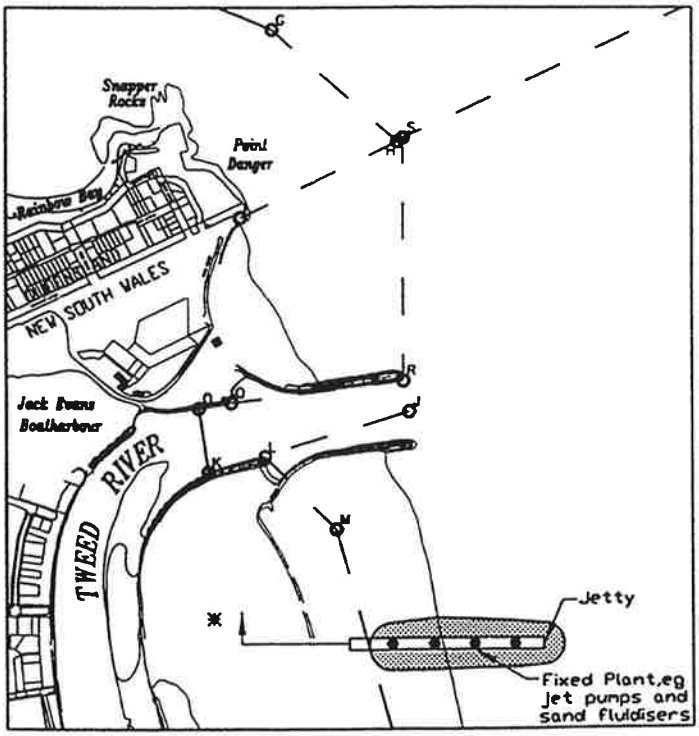

OV-5: JACK-UP DREDGE




FX-1: FIXED PLANT MOUNTED ON SOUTHERN BREAKWATER




FX-2: MOBILE PLANT MOUNTED ON SOUTHERN BREAKWATER

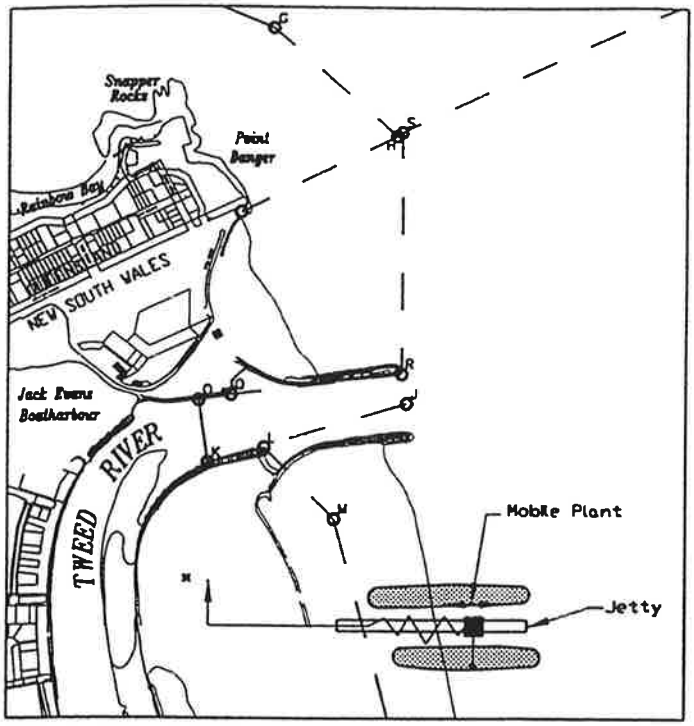



FX-3: FIXED PLANT ON JETTY

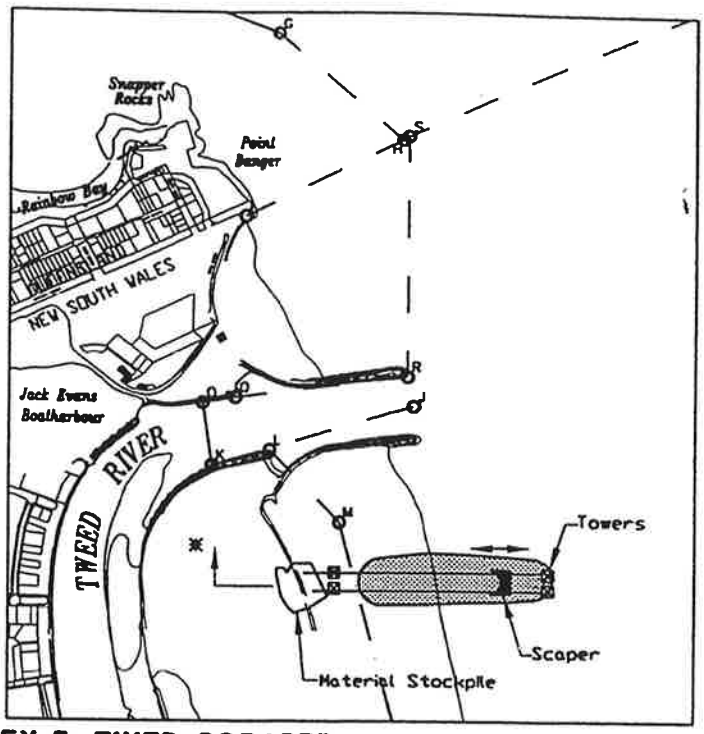
LEGEND
- Potential primary removal area
- Flexible floating pipline
- Submerged pipeline
- × Transportation to placement area (details not shown)

0 400m
Scale

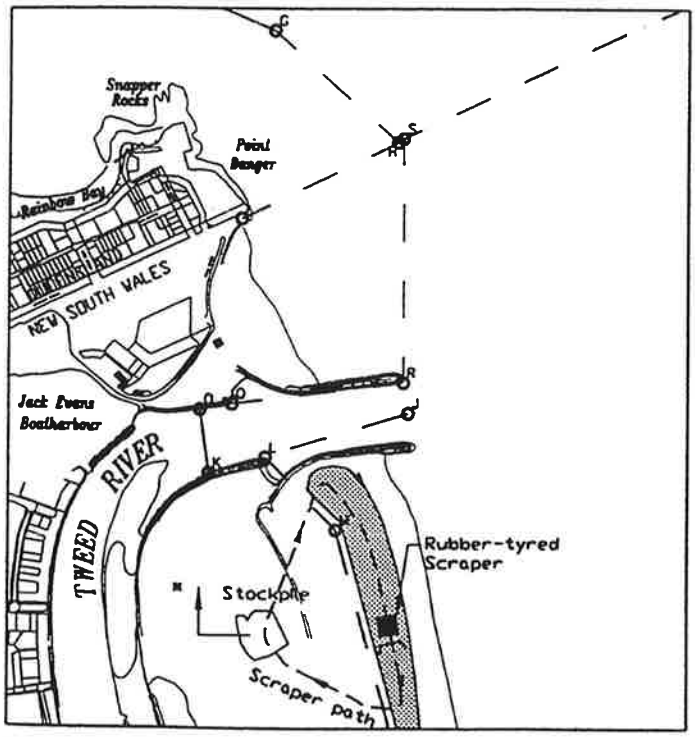
***FIGURE 2.2** CONT.*
*BYPASS SYSTEM ELEMENTS*
*(Source: Hyder Consulting et al, 1997)*



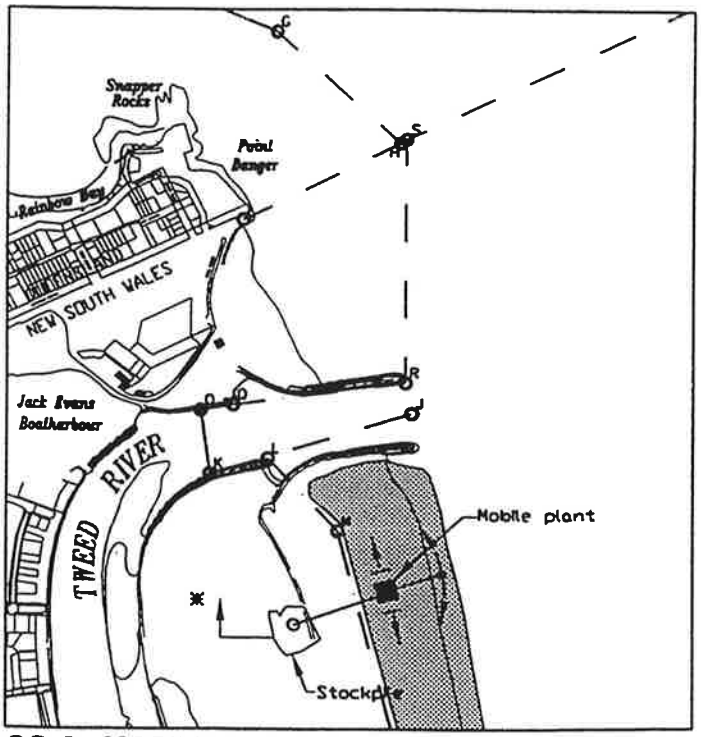

**FX-4: MOBILE PLANT ON JETTY**




**FX-5: FIXED SCRAPER SUPPORTED BY TOWERS AND CABLE (Sauerman scraper)**




**OS-1: SCRAPING USING LAND-BASED PLANT AND EQUIPMENT**

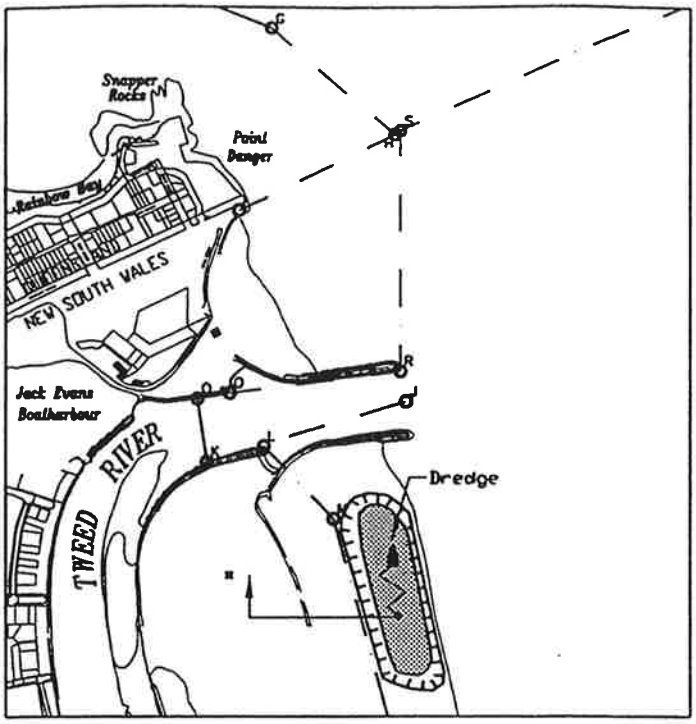



**OS-2: MOBILE LAND BASED PLANT AND EQUIPMENT**

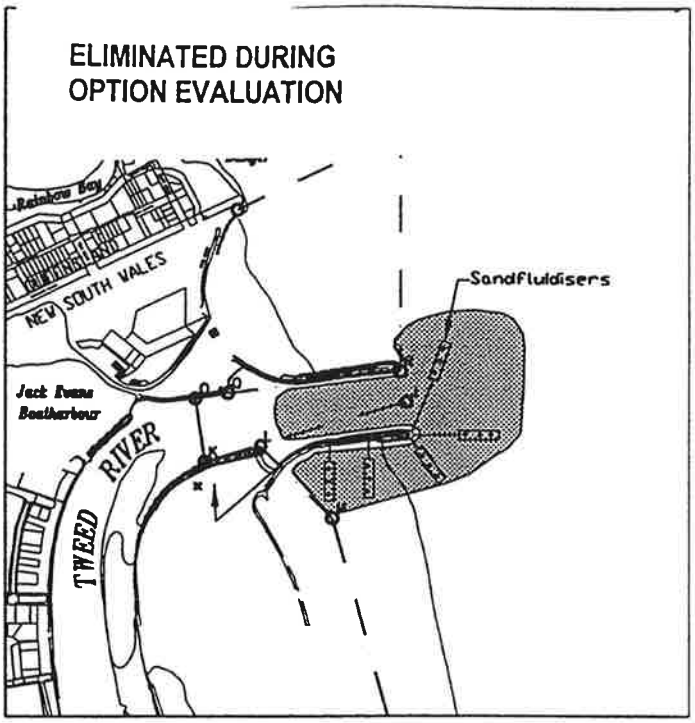
**LEGEND**
- Potential primary removal area
- Flexible floating pipline
- Submerged pipeline
- × Transportation to placement area (details not shown)

0 400m
Scale

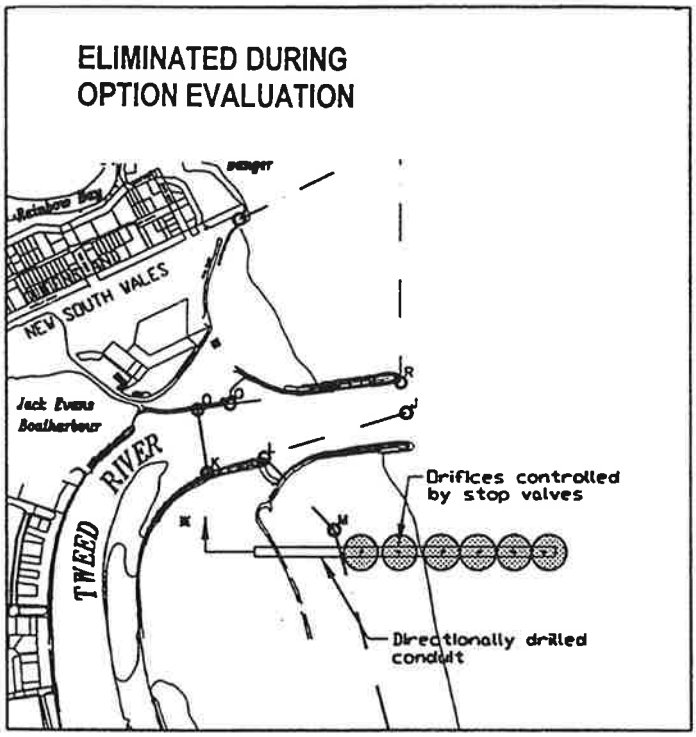
***FIGURE 2.2 CONT.***
*BYPASS SYSTEM ELEMENTS*
*(Source: Hyder Consulting et al, 1997)*



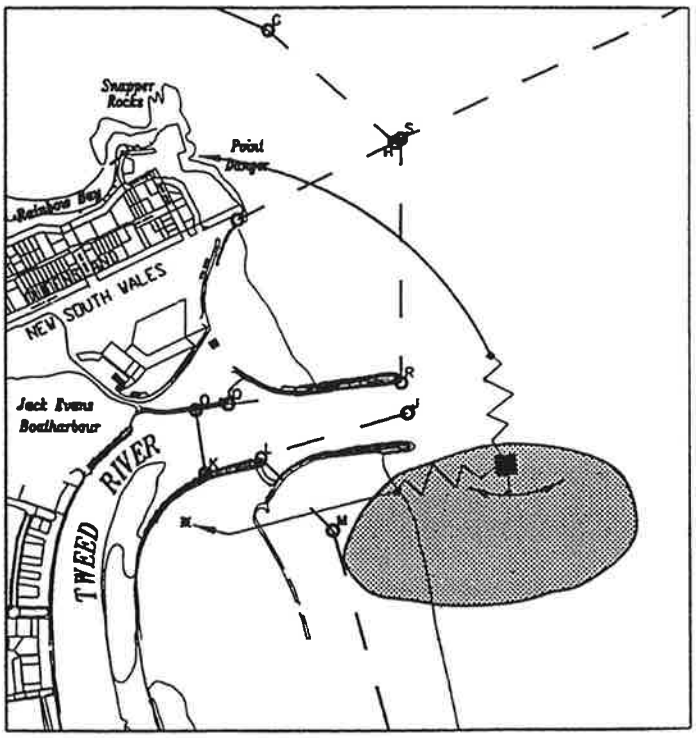

**OS-3: CUTTER SUCTION DREDGER IN UPPER PORTION OF BEACH PROFILE**




**OT-1: REMOTE SAND FLUIDISATION AND SLURRY TRANSPORTION**




**OT-2:REMOTE DIRECTIONAL DRILLING AND SAND FLUIDISATION**

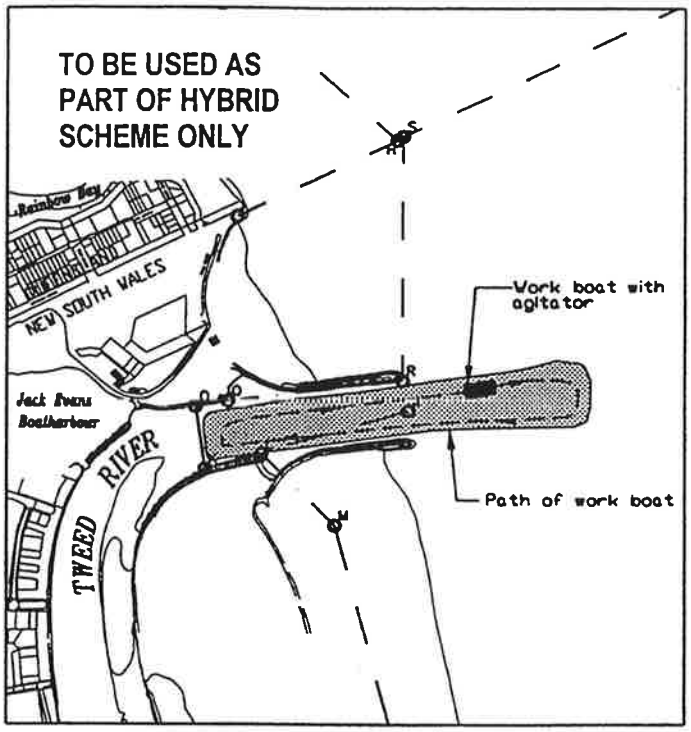



**OT-3: REMOTE SUBMERSIBLE DREDGER WITH WATER JETTING AND SLURRY PUMPS**

**LEGEND**
- Potential primary removal area
- Flexible floating pipline
- Submerged pipeline
- × Transportation to placement area (details not shown)

0 400m
Scale

***FIGURE 2.2 CONT.***
*BYPASS SYSTEM ELEMENTS*
*(Source: Hyder Consulting et al, 1997)*




**OT-4 AGITATION DREDGING**

**LEGEND**
- **Potential primary removal area**
- **Flexible floating pipline**
- **Submerged pipeline**
- **Transportation to placement area (details not shown)**

0 400m
Scale

***FIGURE 2.2 CONT.***
*BYPASS SYSTEM ELEMENTS*
*(Source: Hyder Consulting et al, 1997)*

## 2.4 Bypass System Elements

### 2.4.1 Material Retrieval Systems

**Over the Water Mobile Systems**

*OV-1 Trailing suction hopper dredger in river entrance and nearshore zone*

Trailing suction hopper dredger removes material from the entrance bar and updrift nearshore zone. A trailing draghead agitates sea bed material which is then transported up suction pipes and stored in the onboard hopper. Within the hopper, material settles and the excess water and fines pass back into the ocean. The dredge vessel moves under own power to nourishment area where material is then either pumped ashore, bow cast or bottom dumped.

This option could be used as a primary option or for supplementary dredging in storm events or to collect sand which had leaked from the system.

*OV-2 Cutter suction or suction dredger in river entrance and nearshore zone*

Conventional cutter suction dredge removes and pumps material in a hydraulic slurry via sections of floating, submerged and onshore delivery lines to discharge outlets.

This option would be suitable for use within a protected environment such as the upper portion of the beach profile but would not be suitable for use in the open sea. This option would only be used as part of a hybrid system.

*OV-5 Jack-up dredge in river entrance and nearshore zone*

A floatable, self elevating platform that is used as an offshore base for a suction dredge. The dredge head can be mounted on a slewing arm or housed in a remotely operated vehicle connected to the platform by an umbilical cord. Material is delivered via a submerged pipeline to the required discharge point. Material can be removed in a pre-determined pattern. Platform can be relocated as required by jacking down and floating to a new location.

**Fixed Systems in the Nearshore Zone**

*FX-1 Fixed element of plant located on the southern breakwater*

System comprising fixed plant such as pump and slewing dredge head, mounted on the updrift southern training wall. Material pumped via a submerged discharge pipeline located under entrance channel to a discharge outlet. Dredge head could comprise jet pump, submersible pump and grab.

This option would be restricted in the area from which it could source material because of its fixed nature.

*FX-2 Mobile element of plant mounted on the southern breakwater*

Side cast dredge or dredge head mounted on vehicle which moves along training wall similar to that described for Option FX-1.

*FX-3 Jetty mounted system comprising of fixed plant*

Jet pumps or slurry pumps located at fixed points along a jetty which would be constructed for the project. Dredged material would be pumped through a discharge pipeline that runs along the jetty under and beneath the entrance channel to the discharge outlet. The jetty would be located an appropriate design distance south of the training walls.

This option would be restricted in the area from which it could source material because of its fixed nature.

*FX-4 Jetty mounted system comprising of mobile plant*

Jet pumps or slurry pumps mounted on a moving platform which can traverse along a jetty located at an appropriate distance updrift of the entrance. Sand would then be pumped to the discharge point via a discharge pipeline located under the entrance channel.

**Onshore based mobile systems**

*OS-2 Mobile land based system in upper portion of beach profile*

Involves removal of material from the upper beach profile of South Head Beach using conventional land based plant with long reach capability such as draglines, crawl cranes or excavators that have been customised for dredging through the incorporation of an appropriate removal device attached to the boom.

*OS-3 Cutter suction dredger in upper portion of beach profile*

A large trench is periodically created along the back beach region of South Head Beach parallel to the shoreline using conventional cutter suction dredges. Sand is transferred to downdrift beaches by a discharge pipeline located under entrance channel. After the trench has been completed, it is opened up to allow infilling by natural processes.

**Other Systems**

*OT-1 Remote system comprising sand fluidising and slurry transport*

Sand fluidising conduits are placed and remotely operated within the removal area and used to collect and transport agitated material to an appropriately located sump, from where it can be transferred using jet pumps, a pipe flume, constant density tank, slurry pumps and slurry discharge pipeline.

*OT-2 Remote system with directional drilling, sand fluidising and slurry transport*

A hole is drilled in the identified removal area. The hole is sleeved with a conduit that incorporates nozzles around its annulus. Motive water is then pumped through the annulus for agitation and liquification of cohesionless sediment. Agitated material is then sucked into the inner core of the conduit where an array of jet pumps generate a hydraulic slurry which is then discharged via a pipe flume, constant density tank, slurry pumps and slurry discharge pipeline.

*OT-3 Remote system with submersible dredger supporting water jets and slurry pumps*

A submersible dredge head is utilised which incorporates water jets and slurry pumps for removal of material, flotation tanks and ballast control and an independent propulsion system. The submersible dredge head is connected to a platform by an umbilical cord and cable arrangement that forms part of the flexible discharge pipeline.

*OT-4 Agitation Dredging*

Agitation of sediment by devices such as underwater ploughs, water jets, air lifting equipment and propellers on the ebb tide either dragged, suspended or supported from work vessels. Suspended material is then moved by natural processes out of the removal area.

This method could only be used as part of a hybrid system.

### 2.4.2 Material Placement Areas

The primary discharge area would be Snapper Rocks east in the vicinity of Frogs Beach. Method of delivery at Snapper Rocks east will be by one of the following methods (refer Section 2.4.3):

- direct discharge from shore from one or more outlets allowing natural processes to redistribute the material
- discharge via subaqueous pipeline
- discharge from a trestle structure
- bottom dumping
- pumping from a floating plant

Snapper Rocks west would be used as a supplementary discharge area to Snapper Rocks east and would be used when the short term receiving capacity of Snapper Rocks east is reached or certain weather conditions prevail resulting in persistent northeast waves. Method of delivery at this location would be by one of the following methods (refer Section 2.4.3):

- direct discharge from shore from one or more outlets
- bottom dumping from a hopper dredge or floating plant
- pumping from a floating plant

Duranbah Beach will be a minor placement area in terms of the volume of material to be discharged. In accordance with the TRESB Act, up to 10% of the total volume of material to be transferred would be placed at Duranbah. The method of delivery at this location would be by one of the following methods (refer Section 2.4.3):

- discharge from shore and/or northern side of the northern breakwater from one or more outlets
- bottom dumping
- pumping from floating plant

Kirra Point/Kirra Beach is also a minor placement area and discharge would be from shore from one or more outlets or pumping from floating plant.

In addition, to the placement areas discussed above, material would be placed in the nearshore and outer nearshore placement areas to obtain full nourishment of the beach profile (refer Figure 2.1). Delivery methods in these areas would include bottom dumping, pumping from further offshore or pumping from onshore.

### 2.4.3 Material Transfer and Placement Options

**Onshore Pipeline Transfer and Deposition**

The EIS identifies a range of potential onshore pipeline routes (refer Figure 2.1). One option involves an onshore pipeline which would be located within the easement along the access road to Letitia Spit. From the southern training wall the pipeline would be located to Snapper Rocks via Duranbah Beach or to Kirra Beach via Jack Evans Boat Harbour and Greenmount Beach. An alternative route from Jack Evans Boat Harbour to Snapper Rocks via Rainbow Bay was also identified within the EIS.

Pipelines would be located clear of private property, would not interfere with services, would not restrict public access and would be buried wherever possible or otherwise treated to ensure minimal visual impacts.

Pump booster stations are proposed along the onshore pipeline route at Duranbah Beach, Boundary Street and Kirra Point if required. Any booster stations would be located on Crown or public land, be located underground unless appropriate visual and acoustic

treatment is provided and would be located so as not to restrict public access.

**Pumping Ashore**

Pumping ashore is a method developed with plant such as a trailing suction hopper dredger or hopper barge specifically for beach nourishment works. This method involves the fluidising of material in the hopper and the pumping of this material from the hopper to the subaerial (onshore) portion of the beach profile via a discharge pump, outlet and pipeline. This method involves the dredge vessel anchoring in a mooring area and the coupling of its pump ashore discharge outlet to the discharge pipeline intake that is attached to a floating nearshore intake anchored to the seabed. The discharge pipeline would typically comprise sections that are floating, submerged and onshore. A discharge outlet would be located onshore from which the deposited material would be reworked by land based plant.

The EIS indicates that in sections of the beach profile which are subject to storm activity, the submerged pipeline may need to be permanently buried in a trench. However, the EIS also indicated that it may be more effective to use temporary pipeline which can be decommissioned and towed offshore in the case of a storm. Similarly, between dredging campaigns, the submerged pipeline may be decommissioned.

*Bottom Dumping/ Bow or Side Casting*

Bottom dumping involves a dredger or barge dumping material within the nearshore portion of the active beach profile. Bow or side casting involves the fluidising of material in the hopper and the pumping of this material to a location in the order of 50m in front of the bow or to the side of the vessel. This method is used for profile nourishment within the subaqueous portion of the beach profile and enables placement of material closer to the shoreline than can be achieved through bottom dumping.

*Material Rehandling Area*

Material rehandling areas involve the storage of material following retrieval on the seabed. Material would then be collected by plant such as a small trailer dredger or submersible dredge and placed at the nourishment area as required. This option would be useful in situations where material is required to be retrieved (eg. to maintain the entrance channel) but cannot be placed immediately because of prevailing conditions at the deposition areas.

## 2.5 Associated Infrastructure

The nature of the associated infrastructure required for the proposal would be dependent on the type of system chosen. The following is a summary of the key elements that are likely to be required (refer Figure 2.1).

- Construction Compound: this would include temporary buildings, car parks, access roads and services. The EIS identified the most suitable location for the infrastructure as being on the northern end of Letitia Spit.

- Operations Compound: the scale of this would vary significantly depending on the system but would include an operations control building, car park and lighting. The EIS indicated that the most suitable location for this compound would be at the northern end of Letitia Spit or adjacent to Duranbah Beach or Lovers Rock.
- Material Storage Area: this area may be required during construction for storage of materials and equipment and would be in the order of 500m$^2$.
- Services: services including water, sewerage, power and telecommunications would be required.
- Access Roads: it may be necessary to upgrade the access road to Letitia Spit depending on the expected number of construction and operation vehicles associated with each of the systems.

## 2.6 Construction and Operation Hours

The EIS states that construction hours would be between 7am and 7pm, Monday to Saturday. The construction period would be dependent on the bypass system selected.

Operating hours would depend on the nature of the system selected. Operating hours for mobile systems would be tailored to meet prevailing ocean conditions. The proponent has advised that while fixed systems would not operate continuously they would be required to operate at any time (viz. 24 hours, 7 days per week).

## 2.7 Project Lifespan

The proponent has indicated that approval is being sought for a bypass system which would operate in perpetuity. The EIS recognises that a range of different systems may be required to be used in the future. However, it is anticipated that the initially selected system will operate for a nominal period of 25 years.

## 2.8 Environmental Monitoring and Management

As part of the proposed works, the proponent has nominated a program of pre and post construction environmental management and monitoring measures. These are described in detail in the EIS and Representations Report and summarised in Appendix A of this report. An Environmental Management Plan would be prepared for the construction and operation stages of the project which would contain details of the proposed mitigation measures.

# 3. JUSTIFICATION, ALTERNATIVES CONSIDERED AND IMPACTS IDENTIFIED IN THE EIS

*This section discusses the project need and justification and outlines the alternatives considered and the potential adverse and beneficial impacts of the proposal as identified in the EIS.*

## 3.1 Justification and Need for the Project

The TRESB Act sets the framework within which the bypassing system is being proposed including the need and justification for the works. The Act states that the project is needed to restore a safe and navigable entrance to the Tweed River and enhance the amenity of the southern Gold Coast beaches in perpetuity.

The justification for the project and the worth of the benefits that are expected to accrue have been ratified by the NSW Government in the making of the legislation. The Department considers that the subject proposal is in keeping with the intent of this legislation. Therefore the focus of this report will not be to reassess the justification for the proposed works, but rather, to undertake an assessment of the environmental impacts of the works to ensure that the subject proposal can be undertaken in an environmentally acceptable manner.

The primary objective for NSW is to improve the navigation conditions of the Tweed River entrance and thus improve conditions primarily for the fishing industry and also other river based activities. If the proposal were not to proceed, the entrance bar would silt up to the point that navigation would not be possible. While it is not expected that this would result in a decrease in fishing catches within the broader region, it would have significant effects on the local fishing industry. Feasibility studies undertaken for the project have determined that the entrance conditions are not the main constraint to the ongoing viability of the regional fishing industry. Rather the lack of available fish stocks and the associated lack of new fishing licences are the controlling factor in the growth of this industry. Thus the extent of benefits to the regional fishing industry associated with the works may be limited. The extent of benefits to recreational and other commercial boating activities as a result of the improved entrance bar have not been quantified.

The primary objective for Queensland is to maintain and if possible enhance the recreational amenity of the southern Gold Coast beaches. However, the EIS notes that the effectiveness of bypass operation in achieving this objective is unable to be accurately determined at this stage. As such, comprehensive monitoring and possible refinement of the system following implementation will be required to ensure this objective is satisfactorily achieved and the justification for the project is realised.

## 3.2 Consequences of Not Proceeding

The EIS indicated that the 'do-nothing' option would have the following effects:

- areas dredged during the first stage of the project would progressively infill and the dangerous navigation conditions which existed prior to the Stage 1A dredging would re-establish. Navigation conditions would progressively worsen as the entrance bar would continue to grow until its equilibrium volume was achieved;
- re-establishment of dangerous navigation conditions at the Tweed River entrance bar would adversely affect local maritime based industries such as fishing and recreational activities;
- infilling of the lower Tweed estuary would continue and the lower estuary marine shoals would return to the conditions which existed in past years causing a deterioration in water quality;
- nourishment of southern Gold Coast beaches undertaken as part of the Stage 1A works would not be sustainable and the pre-Stage 1A conditions would re-establish with attendant adverse impacts on beach amenity;
- erosion of southern Gold Coast beaches would cause an 'erosion shadow' to progress downdrift towards the northern beaches thereby undermining the results achieved by the Southern Gold Coast Nourishment Project; and
- the adverse impacts on beach amenity would affect the local economy.

The EIS indicates that if a bypass system were not implemented, in the long term (approximately 20 years), a natural equilibrium of sand bypassing would be established and beaches would receive a natural supply of sand. However, sand deposition at the entrance bar would lead to the river entrance becoming unable to be navigated.

## 3.3 Alternatives Considered

### 3.3.1 Project Alternatives

In addition to the 'do-nothing' option discussed in Section 3.2, a range of project alternatives were assessed and discounted in the EIS and these are outlined below.

*Construct a new Tweed River Entrance*

As part of the Tweed Entrance Feasibility Study that was undertaken in 1989 prior to the development of the Deed of Agreement, the alternative of constructing a new entrance for the Tweed was dismissed due to the high economic and environmental costs.

*Unilateral State government action*

The EIS stated that unilateral action by either the NSW or Queensland governments would not achieve the project objectives and may result in litigation between the two states. The Deed of Agreement for the project recognises that only a joint effort by the two states will

fulfil the project requirements.

*Dismantle Tweed training walls*

Dismantling of the training walls was dismissed as an option for the following reasons:

- depth of the entrance bar would not be improved and may in fact worsen as slugs of sand moved across the entrance;
- increase in the rate of sand supply to the estuary which could result in adverse ecological and water quality impacts;
- ancillary dredging would be required;
- significant erosion at Letitia Spit which would impact habitat values; and
- sand transport processes would be less optimal than that provided by the proposal which allows a more continuous supply of sand to the beaches and the ability to undertake specific beach enhancements.

*Dismantle Tweed training walls and install a permanent bypass system*

Dismantling of the training walls combined with the installation of a permanent bypass system would alleviate may of the disadvantages of the previous option. However, there would be no advantage of this option over the proposal.

*Major extension of entrance training walls*

Extension of the training walls would provide only short term navigational benefits and the resulting disruption to longshore transport would be deleterious for Gold Coast beaches. In addition, construction costs would be high and significant impacts could result from construction of the extension.

*Major extension of entrance training walls in conjunction with bypassing*

This alternative was dismissed as the cost and environmental implications associated with the construction would be out of scale with the proposed works and would compromise the economic viability of the proposal.

*Duranbah as major sand discharge location*

This alternative would not be economically justifiable as it would entail high costs associated with double handling of the material or extension of the northern training wall to capture such material which would be redirected back to the entrance bar under conditions of northerly swell. This option is likely to result in an unacceptable risk of loss of sand to Snapper Rocks through potential nearshore accumulation of sand and potential offshore losses.

### 3.3.2 Bypass System Alternatives

A range of bypass system alternatives were also dismissed during the assessment process in the EIS as follows:

- *Cutter suction dredger working in the river entrance and nearshore zone in conjunction with an entrance weir or breakwater*: this option was discounted because of the high cost, construction impacts and the limited effectiveness of the material retrieval processes.
- *Fixed scraper supported from cables and towers constructed through the nearshore zone and onshore scraping of material using conventional land based plant and equipment*: these options were discounted because of the significant environmental impacts that would occur and the inability of the systems to meet required production rates.
- *Transport of material by truck*: this option was discounted because of the adverse impacts that would result from the significant number of trucks that would be required to fulfil the project objectives.

## 3.4 Major Benefits and Adverse Effects Identified in the EIS

The major benefits resulting from the proposal identified in the EIS were as follows:

- improvement in the safety of navigation of the River entrance with the consequent benefits to commercial and recreational boating, tourism and the fishing industry;
- the restoration, widening and long term maintenance of the southern Gold Coast beaches with associated benefits to tourism and recreational amenity; and
- improved tidal flushing of the River estuary resulting in improved water quality.

The major adverse effects identified in the EIS were as follows:

- potential adverse impact on surfing conditions at Duranbah Beach; and
- potential impact on habitat of the Little Tern at South Head Beach.

# 4. SUMMARY OF REPRESENTATIONS

The following key issues were raised in the representations to the EIS:

- impact on habitat of shorebirds in the vicinity of Letitia Spit;
- impact on surf quality particularly with regard to maintenance of conditions at Duranbah Beach and the need for ongoing monitoring and management;
- impact on sites of Aboriginal archaeological significance;
- impacts on the socio-economic environment including tourism and recreation and commercial fisheries and boating; and
- importance of maintaining a safe and navigable entrance to the Tweed River.

Identification of issues raised in representations to the EIS was undertaken by the proponent as part of its submission to the Minister for approval of the project. The proponent's summary of the issues raised is included in Appendix B of this report.

The Department has independently reviewed the identification of issues undertaken by the proponent and found it to be consistent with its own evaluation.

# 5. PROPOSED ADDITIONAL MANAGEMENT MEASURES

*This Section describes the additional management measures proposed to be implemented as part of the proposal. These additional measures have been developed by the proponent in response to the issues raised in the representations to the EIS.*

Based on an examination of issues raised in the representations, the following additional management measures are proposed by the proponent. The adequacy of these and the need for any additional management measures to be implemented is assessed in Sections 6 and 7.

*Threatened Species Issues*

South Head Beach is considered to be an important habitat area for the Little Tern which is listed as endangered under the Threatened Species Conservation (TSC) Act 1995. If a bypass system was selected that involved disturbance of the South Head Beach area the EIS identified that there may be adverse impacts on this species. As such, the following mitigation measures are proposed:

- The bypassing system will not be established at the same time as the works proposed by Tweed Shire Council for Tony's Bar (refer Figure S.1) which is another important habitat area for the Little Tern.
- If a land based fixed system (refer Section 2.3) is selected as the final bypass system option, all infrastructure and any significant disturbance would be contained within 1000m of the southern breakwater at the entrance of the Tweed River.
- If a mobile nearshore or mobile land based system is selected as the final bypass system option, all mobile infrastructure and any significant disturbance would be contained within 500m of the southern breakwater at the entrance to the Tweed River.
- A public education exercise is to be implemented advising of the use of the South Head Beach by an endangered species, the Little Tern. As a minimum this will involve signage at key beach access points and provision of information to Tweed Shire Council that can be included with 4 wheel drive permits for South Head Beach.
- Suitable substrate is to be provided for Little Tern nesting south of the area influenced by bypassing works/operation. Selection of the nesting enhancement area and management of the area, should nesting occur, would be undertaken in close consultation with National Parks and Wildlife Service (NPWS) and would take into account any social/cultural heritage issues identified in consultation with the local Aboriginal community.

*Indigenous Heritage*

Construction activities will avoid the area of a soak on Letitia Spit, an unquarried portion of rock at Point Danger and a rocky knoll behind Duranbah Beach (refer Figure 5.1) which are considered to be important in terms of Aboriginal archaeological and anthropological significance.


***FIGURE 5.1***
*SITES OF INDIGENOUS HERITAGE SIGNIFICANCE*
*(Source: Davies Heritage Consultants, 1997)*


***FIGURE 5.1 CONT.***
*SITES OF INDIGENOUS HERITAGE SIGNIFICANCE*
*(Source: Davies Heritage Consultants, 1997)*

*General Management Measures*

The following additional general management measures are also proposed:

- Notices will be provided to Mariners regarding dredging operations.
- Consideration of the mullet fishery when finalising construction schedules and options.

# 6. ASSESSMENT OF KEY ISSUES RELATING TO THE MODIFIED PROPOSAL

*This Section of the report provides an assessment of the key environmental impacts of the modified proposal. Issues associated with other environmental impacts are discussed in Section 7. This Section focuses on those issues which are relevant to environmental impacts within NSW. However, for some issues, undertaking an isolated assessment of impacts within NSW is not relevant and the impacts on the broader Tweed Heads/Gold Coast region are examined.*

## 6.1 Flora and Fauna

### 6.1.1 Introduction

The Department has undertaken a review of the assessment undertaken by the proponent relating to the potential flora and fauna impacts of the proposed works. This review has been undertaken to allow determination whether or not the proposal would have a significant effect on threatened species.

The Department had a number of concerns with the flora and fauna assessment contained in the EIS and the supplementary report contained in the Representations Report and requested further information from the proponent. This information was provided in the form of written advice from the proponent and a supplementary flora and fauna survey report. This additional information is contained in Appendix C to this report.

The following sections provide a summary of the Department's assessment of this issue. A detailed discussion of the Department's assessment is contained in Appendix D to this report.

### 6.1.2 Impacts on Letitia Spit

Impacts on Letitia Spit could result from the provision of infrastructure such as access tracks, operation compound, pipelines and car parking areas associated with some of the bypass systems. Neither the EIS nor the Supplementary Assessment contained an assessment of the likely impacts of the proposal on terrestrial flora and fauna on Letitia Spit. At the Department's request, further survey work was undertaken by the proponent and submitted to the Department. This work included a survey of Letitia Spit and targeted a number of threatened species which were identified as having the potential to occur in the study area.

Nine vegetation types were identified on Letitia Spit. The survey also indicated that much of the site contained a dense layer of bitou bush in the understorey and ground layers. No threatened flora species were identified during the survey including the four littoral rainforest species identified by the Department for targeted surveys.

The fauna survey undertaken on Letitia Spit did not find the three species that the Department requested to be targeted during the surveys. Of these species, the assessment concluded that the Long Nosed Potoroo and Wallum Froglet would be unlikely to occur on the site because of a lack of suitable habitat and the Queensland Blossom Bat may use the site for feeding but was unlikely to be affected by the proposed works. However, the survey did identify another threatened species, the Black Flying Fox. An eight part test undertaken for this species concluded that none of the bypass systems would affect populations of this species as it does not roost or breed in this area. The possible removal of a small amount of the food source for this species was seen as an insignificant impact.

The assessment did not identify any other impacts on terrestrial flora and fauna. The Department agrees with the result of the assessment undertaken by the proponent in relation to terrestrial flora and fauna.

### 6.1.3 Impacts on South Head Beach and Tweed River Mouth

The impacts of the proposal on South Head Beach and the Tweed River Mouth relate to the importance of these areas as habitat for a number of species of migratory and resident avifauna species. Impacts would be likely to occur as a result of provision of infrastructure on South Head Beach and changes to beach morphology which could involve foreshore retreat of up to 90m. The following species listed as threatened under the TSC Act were identified as having the potential to occur in this area:

- Sooty and Pied Oystercatchers
- Beach Stone Curlew
- Lesser Sand Plover
- Greater Sand Plover
- Black Tailed Godwit
- Terek Sandpiper
- Sanderling
- Great Knot
- Little Tern
- Black Necked Stork
- Osprey

During assessment of the proposal's impacts on these species, the proponent developed a range of mitigation measures which would be included as part of the proposed works. These mitigation measures were as follows:

- The permanent bypassing system will not be established at the same time as the proposal at Tony's Bar by Council to undertake dredging.
- If a system involving fixed infrastructure with sand intakes located across the nearshore zone was selected as the preferred option, all infrastructure and any significant disturbance would be confined to within 1000m of the southern breakwater.
- If a system involving mobile land based systems which extract sand from beach, berm

and immediate nearshore areas, was selected as the preferred option all such mobile infrastructure and any significant disturbance would be contained within 500m of the southern breakwater.
- A public education exercise should be implemented advising of the importance of South Head Beach as a habitat area for Little Terns.
- Suitable substrate is to be provided for the Little Tern nesting south of the area influenced by the bypassing works.

Eight part tests were undertaken for each of these species in the Representations Report prepared by the proponent. The eight part tests utilised the results of an extensive bird monitoring program that had been undertaken in this area. The eight part tests concluded that the impacts of the proposal on these species were not likely to be significant and that a species Impact Statement would not be required.

A review undertaken by NPWS of the supplementary avifauna assessment indicated its agreement with the conclusions reached by the proponent and recommended that the management measures outlined above should be included as conditions of approval for the proposal.

The Department also undertook a comprehensive review of assessment contained in the EIS and supplementary avifauna assessment. The Department had a number of comments relating to the identification of species that would potentially be affected by the proposed works and the assessment methodology applied. In response to these comments, further information was provided to the Department by the proponent in terms of the assessment process that was undertaken. Following examination of this additional material, the Department agreed that the proposal was unlikely to have a significant effect on avifauna species on South Head Beach or the Tweed River Mouth.

In addition to the management measures developed by the proponent, the Department considers that the following should be undertaken by the proponent:

- prior to commencement of construction works, a management plan for the Little Tern should be developed in conjunction with the Department and NPWS; and
- monitoring of the changes to beach morphology at South Head Beach should be undertaken during operation of the proposed works.

These management measures and those proposed by the proponent are reflected in Recommended Conditions 39 to 42.

### 6.1.4 Impacts within Lower Tweed Estuary

Impacts on avifauna species within the Lower Tweed Estuary would potentially result from changes to the tidal regime. NPWS and the Department requested that further information be provided by the proponent in relation to this issue. The Department identified the Little Tern and Pied Oystercatcher as two species that could potentially be impacted by changes to the

tidal regime if nesting habitats within the Lower Tweed Estuary were affected. The proponent provided further assessment of this issue which concluded that the probability of either of these species nesting in the Lower Tweed Estuary was very low. This conclusion was based on the results of extensive bird monitoring undertaken in this area by a variety of sources. The Department agrees with the result of this assessment. NPWS recommended that the Conditions of Approval for the proposal should include a requirement for monitoring of any changes to the tidal regime within the lower Tweed Estuary and a commitment to suspend operations should these changes become significant to allow reassessment of the potential impacts on avifauna species in this area. This requirement is reflected in Recommended Condition 39.

### 6.1.5 Conclusions

Based on an assessment of the flora and fauna assessment contained in the EIS, the supplementary avifauna assessment contained in the Representations Report and the additional information provided by the proponent during the assessment process, the Department agrees that the proposed works are unlikely to have a significant impact on any threatened species, populations or ecological communities or their habitats.

Recommended Conditions 39 to 42 will ensure a range of management measures are implemented during construction and operation of the bypass system.

## 6.2 Surf Quality

*Existing Environment and Potential Impacts*

The EIS recognises that surfing conditions at Duranbah Beach are among the best in the region. The beach is not regularly used for other recreational water-based activities such as swimming due to the presence of strong rips and currents. The surfing conditions are caused by sand moving across the entrance bar and forming off-shore shoals at Duranbah. Implementation of a bypass system would potentially have adverse impacts on surfing quality at this location. Maintenance of a deep entrance bar will cause the existing sand transport patterns to alter significantly and will result in the erosion of off-shore shoals. The EIS indicates that the beach will retain good recreational beach amenity making it suitable for swimming and other water based activities but surfing quality will be degraded.

*Issue*

A number of representations raised issues in relation to the impacts of the proposal on surf quality at Duranbah. It was considered that the EIS understated the importance and quality of the surf conditions in this area. Socio-economic issues associated with surf quality are discussed in Section 6.4. Maintenance of surf quality was considered to be a key objective of the project and that it should be of equal priority to the navigation safety objectives of the project. It was considered that the primary function of the sand discharge at Duranbah should relate to surfing conditions and not to swimming and other recreational activities.

In terms of the bypass system that would most benefit surf quality, it was considered by local surfing groups that a fixed jetty system would be preferable because it would be the most efficient system in terms of delivering flexible amounts of sand to exact locations and it would provide fair surfing conditions around the jetty structure. It was considered that such a structure should be located at least 500m from the southern breakwater.

A number of comments were made in relation to discharge outlets and rates with the emphasis on the need for flexibility in relation to outlet location and discharge volume being of prime importance. A needs and performance based approach was preferred to a prescriptive volume of sand. It was considered that the proportion of sand to be discharged to Duranbah from the overall Contract Quantity may be inadequate to maintain surfing conditions and that NSW should receive equal benefits from the sand bypassing project in terms of surf amenity.

In terms of managing the impacts at Duranbah, it was generally agreed that the adoption of a 'trial and error' strategy would be the most effective option. Local surf interest groups indicated their willingness to participate in such a scheme. Ongoing involvement of the Community Advisory Committee was also suggested.

*Proposed Management Measures*

The EIS identifies a range of management measures to protect surf quality at Duranbah as far as possible. Provision exists within the deed of agreement for direct discharge of approximately 50,000$m^3$ of sand to Duranbah as a long term annual average quantity. Management measures exist which would either influence the alignment and shape of the beach or which would assist in providing good surfing conditions. The EIS states that the first step in the management of sand discharge at Duranbah is to identify the required function of the beach. The EIS notes that conditions which may not be ideal for surfers can prove beneficial to other beach users.

Two options have been identified for improving surfing amenity which involve either a discharge off the northern training wall or a pipe delivery system.

As discussed, it is difficult to predict the behaviour of off-shore shoals with any degree of certainty, and as such, a trial and error discharge management strategy is proposed.

The EIS states that with ongoing monitoring of surfing conditions and appropriate response procedures, the impacts of the proposal can be minimised. Parameters that would be monitored include:

- offshore wave measurement;
- regular surf quality assessments;
- regular hydrosurveys of nearshore shoals;
- regular hydrosurveys of entrance bar bathymetry; and
- regular aerial photography.

The EIS indicates that detailed numeric process modelling could be used to develop a strategy suited to the adopted bypassing system. It is also stated that consultation with the surfing community, possibly through the established Community Advisory Committee, would be undertaken.

*Consideration*

The Department recognises the potential for a significant impact to occur at Duranbah Beach and the importance of this beach in terms of the local surfing community. However, it is recognised that this potential impact needs to be viewed in the context of the benefits expected to accrue from the proposal, such as improvements to the Tweed River entrance conditions and the amenity of the southern Gold Coast beaches, and the potential to minimise impacts at Duranbah. One of the objectives of the proposal should be to maintain the surfing conditions at this location. Given the difficulty of predicting the extent of the impacts at this time, a flexible 'trial and error' strategy would be the most effective.

To this end, the development of a surf quality management strategy for Duranbah which allows a flexible approach to discharge volumes and locations as recommended in the EIS is endorsed.

The Strategy should be developed in consultation with the local surfing community and should address the following issues:

- proposed discharge strategy in accordance with the requirements of the TRESB Act outlining discharge locations and methods and procedures for determining discharge volumes;
- monitoring parameters and program including provision for monitoring of directional wave measurements, surf quality, hydrosurveys of nearshore shoals and river entrance and regular aerial photography; and
- consultation and feedback procedure with local surfing community.

The Strategy should be a working document that allows adequate scope for changes to be made to the discharge strategy based on the results of ongoing monitoring. Recommended Condition 38 reflects the requirement to prepare this Strategy.

In terms of the comments in relation to the preference for a fixed jetty system, the Department agrees that the focus of the discharge strategy at Duranbah should be on flexibility. However, selection of a jetty structure system would not prevent any significant advantages over other systems in terms of discharge flexibility. In addition, locating the structure at least 500m from the southern breakwater would have the potential to impact on the habitat of the Little Tern on South Head Beach which would be undesirable.

## 6.3 Indigenous Heritage

In its representation to the EIS, NPWS stated that the indigenous heritage assessment presented in the EIS was inadequate in terms of meeting NPWS legislative and policy

requirements. Specifically, the requirements for assessment of cultural heritage and Aboriginal consultation regarding Aboriginal site management were considered inadequate.

The impact of the proposal on the archaeological sites shown on Figure 4.6.4 of the EIS including the impact on the identified baptism sites at Kerosene Inlet (refer Figure S.1) was considered to require further assessment. NPWS requested that the proponent consider the need for further research with a view to adding further to the knowledge of the Aboriginal cultural heritage significance for the area.

*Results of Supplementary Investigations*

The proponent undertook a supplementary cultural heritage assessment to address the issues raised by NPWS (Davies, 1997). Further surveys were undertaken in conjunction with members of the local Aboriginal community. The following areas were surveyed:

- northern extent of Letitia Spit;
- area along the northern bank of Jack Evans boat harbour; and
- area adjacent to Duranbah Beach and base of Point Danger.

The assessment found that it was unlikely that any sites of Aboriginal significance would exist in the area of Letitia Spit, that there is negligible potential for locating surface or sub-surface sites in the area of Jack Evans boat harbour and that the area adjacent to Duranbah Beach and base of Point Danger is an area of archaeological potential.

The survey found that the following locations have potential archaeological significance (refer Figure 5.1):

- rocky knoll located behind Duranbah Beach; and
- ochre deposits at Point Danger;

An assessment of the significance of these sites to the Aboriginal community and in terms of their archaeological potential was undertaken. The local area is considered by the local Aboriginal community to have a high level of spiritual significance despite the significant disturbance that has taken place. In terms of anthropological significance, the rocky knoll behind Duranbah Beach has the potential to contain Aboriginal cultural material and as such, should not be disturbed during construction activities. In addition, the ochre source at Point Danger may have been used by Aboriginal people and a recently formed soak at Letitia Spit, while not being of archaeological significance, is of educational value. It is also considered by the local Aboriginal community that disturbance to the training wall at Letitia Spit should be kept to a minimum.

In terms of archaeological potential, the assessment concluded that the rocky knoll behind Duranbah Beach affords potential research value, but that the ochre deposits at Point Danger provide very limited research value.

As a result of the assessment, the following recommendations were made:

- Construction activities should avoid the area of the soak on Letitia Spit, the unquarried portion of Point Danger and the rocky knoll behind Duranbah Beach. Disturbance to the training wall along the northern margin of Letitia Spit should be kept to a minimum.
- Consultation should be undertaken with the Tweed-Byron LALC and Pooningbah Aboriginal Corporation following selection of a preferred system regarding the placement of infrastructure works.
- If any archaeological remains are discovered during the construction activities, NPWS, Tweed-Byron LALC and Pooningbah Community Aboriginal Corporation should be informed immediately and the appropriate action taken under the National Parks and Wildlife Act 1974.

In relation to the other issues raised by NPWS, the proponent advised that the sites shown in Figure 4.6.4 of the EIS including the baptism sites were outside the study area and would not be directly affected by the proposal. The EIS states that the change in tidal range as a result of the proposal would be minimal and would have a negligible impact on these sites.

*Consideration*

The Department endorses the recommendations contained in the supplementary cultural heritage assessment which were developed in consultation with the local Aboriginal community. The proponent has indicated that these recommendations would be implemented. Ongoing consultation with local Aboriginal communities should be undertaken following selection of a preferred system given the high level of anthropological significance of the area. The level of consultation should be commensurate with the bypass system selected and should be outlined in the Consultation Strategy discussed in Section 7.10.

The Department considers that if the above measures are implemented, the impacts of the proposal on indigenous heritage within the study area will be acceptable. Recommended Conditions 35 and 36 reflect these requirements.

## 6.4 Socio-Economic Issues

### 6.4.1 Tourism and Recreation Industry

The main issues that were raised in relation to tourism and recreation were the benefits of the proposal in relation to activity in the vicinity of the southern Gold Coast beaches and the negative impacts that would result from the potentially worsened surfing conditions at Duranbah Beach.

*Consideration*

The Department recognises the importance of the Tweed/Gold Coast region in terms of tourist and recreational activity and the direct and indirect benefits to industry and employment. The Department also recognises the assertion in the EIS that the beaches and the associated recreational activities are one of the main attractions for tourists to the area. The EIS provides a qualitative assessment of the expected benefits of the proposal in terms of recreational and tourist activity to the area. The benefits are expected to result from a more consistent supply of sand to the area and improved surfing conditions and amenity on the southern Gold Coast beaches.

The EIS states that the only expected adverse impact is a potential reduction in surf quality and consistency at Duranbah Beach. However, the EIS states that even with a reduction in surf quality, Duranbah Beach will be suitable for other beach related activities which are currently not undertaken at Duranbah. No quantitative assessment of the socio-economic impacts of the change to surfing conditions at Duranbah Beach is provided in the EIS.

In principle, the assertions made in the EIS regarding improved recreational amenity on the southern Gold Coast beaches are justified. However, no accurate estimation can be made of the extent of the benefits or the economic impacts on local industry that would result. It is recognised that even with the bypassing system in place, there will still be a degree of natural variability in terms of shoreline retreat and therefore beach amenity due to storm events.

As a result, the focus of management of beach amenity should be on identifying the needs of beach users and monitoring the performance and effects of the selected system to ensure these needs are being fulfilled. As part of the overall discharge strategy for the selected system, procedures for monitoring beach amenity are required. This will be undertaken by regular beach surveys and through feedback from the community involvement program.

In addition procedures should be included in the discharge strategy for action to be taken following storm events to ensure beach amenity is restored as soon as possible. Recommended Condition 38 reflects the requirement to prepare a discharge strategy for the works which would encompass these issues.

Onshore or nearshore dredging or placement work should be avoided during peak beach activity periods to minimise disturbance to use of the beach and maximise public access. In addition, appropriate warning and safety measures should be implemented to protect public safety. These requirements are reflected in the requirement to prepare a Sand Retrieval and Discharge Strategy in Recommended Condition 38.

As discussed earlier, the Department is concerned about the potential for reduced surf quality at Duranbah Beach and the potential socio-economic impacts. As discussed, this beach is currently primarily a surfing beach and this function should be maintained as far as possible. The monitoring and management strategies discussed in Section 7.2 should be implemented to achieve this goal.

### 6.4.2 Commercial Fishing and Boating Activities

A number of representations to the EIS raised the issue of the impact of the proposal on the commercial boating and fisheries industries. There was general support for the proposal in terms of the likely positive impact on these industries that would result from the improved navigation conditions at the River Entrance.

However, concern was expressed about the need to prevent the disturbance of the mullet and whiting fishery industries particularly during the migration season for these species of fish. It was considered that the jetty system would have the potential to deter use of the estuary by these species and thus adversely affect fishing interests. It was also considered that the use of mobile water based plant would need to be managed so that there was no interference with fishing activities.

In addition, the Department is concerned about the impact of the proposal on commercial beach worm fishing activities on South Head beach if a mobile land based system were to be employed.

*Consideration*

The Department recognises the importance of the fishing industry based at Tweed Heads to the local area. The proponent has indicated that the fishing industry is worth approximately $12 million annually to the local economy and employs (directly and indirectly) approximately 250 people.

The EIS states that the current state of the river entrance is a constraint to the fishing industry based in Tweed Heads to the advantage of other ports such as Southport. The EIS states that there is some evidence that a number of boats which had previously been based at Tweed Heads had moved to Southport because of the inconsistency of the navigation conditions at the River entrance. The bar acts as a constraint which dictates the timing and frequency of fishing activities and the degree of safety that applies when boats pass through the entrance.

It was indicated that if the proposal were not to proceed, then the bar would silt up to the point that navigation would not be possible. While it is not expected that this would result in a decrease in fishing catches within the broader region (as more boats would move to Southport and other ports), it would decimate the local Tweed Heads fishing industry. Any improvement to the entrance conditions would benefit individual trawling fishing operations both financially and in non-tangible ways such as through decreased stress due to a safer environment. However, no regional production increases are likely to occur.

Further information provided by the proponent has indicated that while the entrance bar conditions act as a constraint to navigation and thus development of the fishing industry, the main constraints to improved conditions for the regional fishing industry were the apparent

declining resource, legislation restricting the issuing of more licences and a lack of financial inducement to exploit other resources.

The benefits that would be expected to accrue to the local fishing industry from the proposal are more consistent entrance conditions resulting in an increased number of days when the entrance would be navigable and improved safety conditions. The proponent has indicated that regular hydrosurveys of the entrance bar are proposed to ensure that satisfactory entrance conditions are maintained. This is endorsed by the Department.

In terms of potential impacts on fish migration as a result of the bypass system, the Department considers that further consultation should be undertaken with NSW Fisheries and local fishing operators to determine if there are critical periods during which bypassing activities should be minimised or avoided to alleviate impacts on migration paths of commercial fish species. Recommended Condition 7 reflects the requirement to undertake this consultation. This information should be included in the overall bypass system strategy. It should be noted that the need to program activities to avoid times of fish migration, particularly during May to August, will have to be balanced by the need to avoid disturbance of South Head Beach during migration of migratory bird species which use this area for habitat during the summer months.

The Department also recognises the importance of commercial and recreational boating activities (viz. diving and deep sea fishing operators) and the detrimental impact the current river entrance conditions have on their operations. The benefits expected to accrue to the commercial fishing industry would be expected to be reflected within this sector, however, it is not possible to make a quantitative analysis of this predicted impact.

In terms of the impacts on commercial beach worm farming operations, the proponent has advised that the majority of the bypass systems would involve gradual recession of the Letitia Spit and that this process would replicate the natural recession of the beach. As such, beach worm colonisation would be unaffected. If a cutter-suction option were selected, beach worm habitat would be destroyed in the specific local area of extraction. However, the proponent indicates that recolonisation from the unaffected area is likely in a relatively short time following stabilisation of the beach area. If a cutter suction dredge option is selected as the preferred option, consultation with potentially affected beach worm farmers should be undertaken prior to commencement of construction to inform them of the expected bypass process and timing. This requirement is reflected in Recommended Condition 7.

# 7. ASSESSMENT OF OTHER IMPACTS RELATING TO THE PROPOSAL

## 7.1 Noise and Vibration Impacts

The EIS provided an overview of the likely impacts of the proposal in terms of noise generation during construction and operation. The EIS stated that no detailed study was possible because of the uncertainty of the configuration of the preferred option. The major noise sources that were identified were construction activities including traffic movements, pipeline operation including booster pumps and pumping stations. Pipelines and pump stations were also identified as potential vibration sources. Construction was proposed to take place between 7am and 7pm Monday to Saturday, while operation hours would depend on the nature of the system selected. Operating hours of mobile systems would be tailored to meet prevailing ocean conditions. While fixed systems would not operate continuously they would be required to operate at any time (viz. 24 hours, 7 days per week).

The EIS stated that with appropriate control measures in place such as enclosures for machinery and insulation of pipeline, noise and vibration impacts during construction and operation would satisfy Environment Protection Authority (EPA) criteria as contained in the Environmental Noise Control Manual (ENCM).

The EPA indicated in its representation that it endorses the statement made in the EIS that any noise generated by the pumps should be inaudible at residential properties.

*Consideration*

The noise generated during construction and operation should meet the EPA's noise control criteria as outlined in the ENCM. However, insufficient information is provided in the EIS to determine whether this is achievable for any of the systems. While it is recognised that the potential noise sources are generally of a minor nature, there is still a potential for impacts to occur given the existing low background noise levels, the presence of residences close to the potential pipeline routes and the possibility of 24 hour operation of the system.

Following selection of a preferred system, a detailed noise assessment should be undertaken and a Noise and Vibration Management Strategy prepared. The assessment should detail whether or not the ENCM criteria will be met and if not what mitigation measures will be implemented to reduce any impacts to an acceptable level. Full justification should be provided for any inability to meet the relevant criteria. The assessment should include an assessment of traffic noise generated during construction and operation and specify vehicle routes. This requirement is reflected in Recommended Condition 26.

## 7.2 Non-Indigenous Heritage

The representations to the EIS raised a number of issues in relation to the impacts of the proposal on non-indigenous heritage and in particular the impacts on maritime archaeological sites in the form of historic shipwrecks. The NSW Heritage Office made the following comments in relation to this issue:

- a detailed archaeological survey should be undertaken prior to undertaking dredging operations;
- there is a need to consider more specifically the steps that would be undertaken in the event of a disturbance of a shipwreck and a detailed management strategy needs to be prepared;
- there is a need to determine the system specific impacts of the proposed works with advice from a qualified and experienced archaeologist;
- the GIS model developed by the Centre for Coastal Management should be used in identifying any sites in the area;
- there may be a need to obtain permits under the NSW Heritage Act 1974 and/or the Historic Shipwrecks Act 1976; and
- impacts of the proposal on any items of terrestrial historic archaeology need to be assessed.

*Consideration*

The EIS states that a number of shipwrecks are known to have occurred in the study area and that there is potential for remains to be present. However, it is not known how intact the remains will be as a result of previous dredging activities and construction of the training walls. The EIS states that any remains will be likely to be buried under mobile sand build-up.

The EIS states that if a jetty mounted system or mobile land based systems are selected remote sensing could be undertaken to identify potential shipwreck sites. The proponent has further advised that for either of these systems the contractor would be likely to instigate a program of geotechnical investigation in a prospective material retrieval location. If the location is in an area where potential shipwreck sites have been identified, the proponent has indicated that more detailed remote sensing may be undertaken.

The proponent has indicated that prior to Stage 1A dredging works, remote sensing was undertaken within the study area to locate potential shipwreck sites. The proponent has also indicated that for the Stage 2 works, all dredging would generally be above the 1960 profile and that, as such, disturbance to any historical shipwreck sites would be very unlikely.

The proponent has indicated that the contractor would be required to prepare a Historic Shipwreck Management Strategy prior to commencement of construction which would allow for procedures to protect identified potential shipwreck sites and outline procedures to be followed if further relics are encountered during construction and operation of the system.

The Department considers that further information relating to the potential impacts of the proposal on items of maritime archaeology should be provided following selection of a preferred system. The Department concurs with the proposal to prepare a Historic Shipwreck Management Strategy prior to construction. The Strategy should:

- be prepared in conjunction with a specialist maritime archaeologist;
- be prepared in consultation with the NSW Heritage Office;
- outline further investigations (including detailed remote sensing and test excavations) that may be required based on the results of the earlier remote sensing and the construction and operating parameters of the selected bypass system;
- outline a detailed strategy to be implemented if any potential sites are discovered during construction or operation; and
- identify the requirements under the Historic Shipwrecks Act 1976, NSW Heritage Act 1974 and Navigation Act.

The requirement to prepare this Strategy is reflected in Recommended Condition 28.

In terms of terrestrial archaeological remains, the Environmental Management Plan for the project should detail procedures to be followed if any suspected archaeological remains are encountered during construction works. The requirement to prepare the Environmental Management Plan is reflected in Recommended Condition 12.

## 7.3 Visual Impact

The Department recognises that the study area contains areas of varying visual amenity with some locations such as in the vicinity of Letitia Spit and Duranbah Beach having high visual qualities. The study area also has a large viewing population.

The EIS states that each of the bypass systems would have the potential for impacts of varying degrees on the visual amenity of the study area. Mobile water based systems are considered to have the lowest visual impact while remote systems are considered to have moderate visual impact. Mobile land based systems, jetty structures and jack-up dredge systems are considered to have high visual impact. In terms of sand placement and transfer systems, the pipeline routes will have the potential for some visual impact as will the discharge outlets.

*Consideration*

The Department agrees that bypass systems involving mobile water based dredging equipment would be preferable in terms of visual impact. Mobile land based systems would have a significant impact on Letitia Spit while in operation. However, the proponent has advised that when not in use, such systems would be stored in the operation compound which would be located behind the frontal dunes. Such an area would be screened by existing vegetation and as such the visual impact would be lessened.

Jetty structures and jack-up dredge systems would have a significant visual impact on Letitia Spit and surrounds. Design of these structures should be undertaken in a sympathetic manner. The choice of colour finishes should be selected so that the visual intrusion of the structures is minimised.

In terms of the pipeline routes, the proponent has advised that permanent pipelines will be buried where possible to minimise visual impacts. Where pipelines cannot be buried because of topographic or geological constraints such as in proximity to the cliff base at Snapper Rocks, they should be placed in an unobtrusive manner and appropriate colours selected to minimise visual intrusion. The Department agrees with the statement made in the EIS that consultation should be undertaken with Tweed Shire Council in this regard.

Ancillary works such as car parking areas and construction and operation compounds would have the potential for some visual impact. However, as these areas will be screened by existing vegetation the impact is considered to be acceptable.

A landscaping plan should be developed following selection of the preferred system and included in the EMP for the works. Requirements relating to landscaping and visual impacts are reflected in Recommended Conditions 22 to 25.

## 7.4 Air Quality

The potential impacts of the proposal in relation to air quality impacts are mainly related to construction stage activities. The EIS identifies the following likely sources of dust generation:

- laying of pipelines
- construction of ancillary infrastructure such as car parking areas, work compounds
- stockpile sites
- use of unsealed haulage roads to Letitia Spit

Operation stage impacts would be expected to be minor and limited to fumes from machinery.

The EIS does not provide any information on the extent of the impacts for each system however, it is stated that mobile systems would have the least impacts during construction and operation.

*Consideration*

The Department agrees with the identification of major dust generation sources in the EIS.

The use of the unsealed haulage road to Letitia Spit would have the most significant potential to result in dust generation. No information has been provided regarding the number of movements that would occur along this road during construction and operation and thus it is not possible to assess the likely extent of impacts. While sealing of the haul

road would minimise dust generation caused by traffic, it could result in associated adverse impacts both during sealing activities and also following sealing when additional traffic may be attracted to the road. As such, other measures to control dust generation such as the use of water carts or even partial sealing of the road past residences should be considered to ensure dust levels in the vicinity of residences along the access road are managed to an acceptable level. This is reflected in Recommended Condition 29.

In terms of other dust generation sources, standard suppression measures (such as use of water carts and stockpile covers) should be implemented. These measures will need to be identified in the Environmental Management Plan for the project. This requirement is reflected in Recommended Condition 29.

## 7.5 Water and Soil Management

The key issues identified with respect to water quality are as follows:

- water quality impacts due to disturbance of acid sulphate soils or contaminated soil during construction of pipeline
- ocean water quality
- turbidity effects due to bypassing operations
- water quality impacts within Tweed estuary
- stormwater and wastewater management during construction

The EPA indicated in its representation that water quality impacts due to the proposal should be minimal provided standard pollution control devices were implemented as necessary.

*Consideration*

The construction of the pipeline routes would have the potential to disturb any areas of acid sulphate or contaminated soils that may exist along the route. The EIS states while acid sulphate soils (ASS) are likely to occur within the locality, the construction activities would not directly affect any of these areas. The EIS provides no information about the possibility of contaminated land existing along the pipeline routes. Given the uncertainty of the pipeline routes at this stage, further information on the potential to disturb acid sulphate soils should be provided once the preferred system has been selected. To this end, the draft guidelines produced by the NSW EPA, the Department and the Acid Sulphate Soils Management Advisory Committee, '*Acid Sulphate Soils - Assessment and Management Guidelines*' (November, 1997), should be used to undertake an assessment of the potential for ASS disturbance and the development of appropriate management techniques. This is reflected in Recommended Condition 30.

The EIS indicated that sampling undertaken on the material to be transported has indicated that it is of high quality with no contaminants.

In terms of turbidity effects due to bypassing operations, the proponent has indicated that due to the almost total absence of fines in the material to be transported, the turbidity effects

would be minimal. The selection of the Snapper Rocks west location as the main discharge point was selected to ensure any turbidity effects that may occur would be located away from recreational beach areas.

The EPA identified the potential for turbidity to occur following storm events when silt may be deposited from the lower reaches of the Tweed estuary on the entrance bar and then transported by the bypass system. The proponent has indicated that during a flood event, the muddy sediment load is carried in suspension several kilometres out to sea and would be unlikely to be deposited on the entrance bar. Between flood events, the energy regime of the bar would be too high to allow any mud to settle on the surface of the bar. Thus the bar and environs would be unlikely to contain significant amounts of silt for extended periods.

However, if during storm events turbidity was experienced, the proponent has advised that discharges would not be undertaken at recreational beaches. The Department endorses this proposed management measure and considers that it should be contained in the discharge strategy for the selected system. The requirement to prepare this strategy is reflected in Recommended Condition 31.

Concern was also raised about the quality and potential contamination of sediments that could be deposited on the entrance bar from the estuarine shoals and other parts of the Tweed River following flood events and the subsequent potential for contamination of deposition areas. The proponent has provided additional information relating to the quality of sediments at the Tweed River entrance and within the lower reaches of the Tweed River. The analysis of sediment samples from the Tweed River entrance concluded that the samples were unpolluted both chemically and bacteriologically. All other contaminants for which the samples were tested, including pesticides, heavy metals, herbicides and nutrients, were either not detected or well below acceptable levels. Similarly, the samples taken from the lower reaches of the Tweed River were found to have very low levels of contaminants. Concentrations of heavy metals, oil and grease detected in the samples were generally negligible. Thus, the potential for pollution resulting from the deposition of contaminated sediments would be low.

The EIS indicated that water quality within the Tweed estuary would be expected to improve slightly as a result of improved flushing that would result from the operation of the bypass system. The Department recognises that water quality within the Tweed estuary is largely influenced by the surrounding land use, but that the proposal would result in a minor benefit to water quality.

In terms of stormwater and wastewater management during construction and operation, the Department considers that water quality impacts will be able to be managed to an acceptable level and that management procedures should be included in a Water Quality Management Strategy to be prepared as part of the Environmental Management Plan for the works. This requirement is reflected in Recommended Conditions 12 and 14.

## 7.6 Traffic and Access Impacts

A number of issues were identified by the Department and in the representations as requiring further consideration in relation to this issue. The impacts associated with the use of access roads and the local road network during both construction and operation of the proposal were only dealt with briefly in the EIS. No quantification of the expected impacts was provided and no indication was provided as to proposed road upgrading works. In particular, the need to upgrade the access road between Fingal and Letitia Spit was not adequately addressed.

Other issues that required further consideration include the hours that traffic movements would occur and the responsibility of the proponent to repair any damage caused to the road network.

*Consideration*

The proponent has provided further information in relation to the proposed impacts of traffic during construction and operation. The Department considers that the most significant impacts would occur on the access road to Letitia Spit given the surrounding residential land use and the potential for traffic movements to be concentrated along this route.

However, the proponent has indicated that it is not possible to provide vehicle numbers at this time for construction and operation as this will depend entirely on the bypass system selected. However, the following information was provided:

- There would be no regular long term transport of heavy materials to or from the site.
- Jetty type systems would require the most amount of material to be transported. Such material would be limited to steel structure material deliveries, installation equipment, pre-mix concrete deliveries, transport of pumps etc. Such transport would require the use of heavy vehicles but would be relatively infrequent occurring in short bursts over a 12 month construction period.
- Systems such as the mobile water based dredger options would involve no construction traffic and other systems such as sea-bed fluidisers would involve relatively little transport of materials.
- It is likely that the existing track from Fingal to Letitia Spit would be upgraded to either a better class gravel road or a sealed road.

The Department considers that there is still insufficient information to allow a comprehensive assessment of the impacts of the proposal on the local road network and the land use adjacent to the road.

Therefore, prior to commencement of construction, unless the system comprises solely a mobile water based dredger system, a comprehensive traffic management strategy should be prepared. This strategy should contain details of the likely numbers of construction and operation vehicles, proposed traffic routes, proposals to upgrade the access roads, hours of traffic movements, procedures to inform the local community of the works and other

proposed mitigation measures. The plans should be prepared for the specific bypass system which is selected. This requirement is reflected in Recommended Condition 21.

## 7.7 Navigation Management

A number of comments were received in the representations to the EIS which indicated support for the proposal on the grounds that it would improve navigational conditions at the Tweed River entrance.

The EIS recognises the likely benefits, but states that these benefits may be offset if more inexperienced sailors attempt to use the entrance which may result in further accidents. However, the Department considers that this impact can be mitigated through the implementation of appropriate navigation hazard warnings and an appropriate education campaign.

The proponent advises that the operation of any of the bypass systems would not have detrimental effect on navigation conditions through the entrance. The only impacts that would be likely to occur may be delays of a few minutes if a mobile dredger was in operation.

The Department recognises that the proposal will improve navigation conditions but also considers that appropriate management measures should be put in place to ensure any disruption or modification to navigation conditions caused by the sand bypass system. The appropriate management measures will be required to be specific to the selected system and should be included in the Environmental Management Plan for the proposal. The requirement to prepare the Environmental Management Plan for the works is reflected in Recommended Condition 12.

Examples of management measures that are proposed by the proponent and endorsed by the Department include:

- all overwater plant including survey vessels, stakes, buoys and pipelines used by the proponent shall display the correct navigation signals and be clearly marked and lit at night to the satisfaction of the Waterways Authority;
- dredging shall be organised so that the dredging plant is so positioned as to allow the normal passage of vessels to the satisfaction of the Waterways Authority and/or the Harbour Master; and
- the proponent shall prior to establishment of the dredging plant on site notify the Waterways Authority and the Harbour Master of the proposed dredging program and methods and any changes to the program or methods.

## 7.8 Lower Estuary Shoals Management

The implementation of a permanent sand bypassing system would have the potential to impede and perhaps prevent re-building of the lower estuary shoals near Kerosene Inlet following major storm events. The EIS indicates that because the post flood recovery of the

lower estuary marine shoals would be much slower, the tidal hydrodynamic impacts and the consequential ecological stress on the estuary would last much longer than experienced under existing conditions. The shoals should therefore be reinstated to an optimum level as soon as possible after a major flood event.

The existing Tweed River Management Plan contains provisions for protecting the lower estuary shoals by ensuring dredging is not undertaken downstream of the confluence of Terranora Creek (refer Figure S.1) and the main reach of the Tweed River. The implementation of a bypass system would affect the maintenance of the shoals after a large flood event as outlined in this Plan. A number of representations to the EIS, including those from Tweed Shire Council and the North Coast Office of the Department of Land and Water Conservation (DLWC), concluded that the project should be responsible for maintenance of the shoals.

The EIS recognises the need for a Lower Estuary Shoals Management Plan to be included as part of the Tweed River Management Plan but concludes that responsibility for implementing the Lower Estuary Shoals Management Plan should not form part of the project. However, the proponent recognises that the implementation of a bypass system would place greater emphasis on the need for post flood scour restorative works because of the extended time that would otherwise be required for natural recovery. The proponent also recognises that the system may introduce the need for periodic restoration of the shoals if bypassing leads to a net loss of marine sand through the entrance.

The Department endorses the need for a Lower Estuary Shoals Management Plan to be developed. It is recognised that the bypass system would affect the recovery time of the shoals following a flood event and therefore, the bypass project should have an ongoing role in the development and implementation of this plan particularly in relation to developing procedures for post-flood recovery of the shoals.

Other agencies including Tweed Shire Council should also be involved in this issue to ensure a holistic approach to the situation is implemented consistent with other works being undertaken as part of the broader Tweed River Entrance Management Plan. Therefore consultation should be undertaken between the proponent and other relevant parties including Tweed Shire Council and the Tweed River Management Committee to determine appropriate responsibilities for development and implementation of the Plan. The requirement for the proponent to participate in the preparation of the Plan is reflected in Recommended Condition 37.

### 7.9 Native Title Issues

The proponent has advised that an Aboriginal land claim has been granted in respect of land on Fingal Peninsula and that four native title claims are pending over other areas of land in the study area. Details of the areas covered by these claims have been provided by the proponent.

The proponent has indicated that in order to make sure land required for the bypassing

system is available, negotiation with the relevant Aboriginal groups would be undertaken following selection of a preferred system.

Consultation with the relevant Aboriginal groups should be ongoing throughout project selection and implementation in relation to native title and other indigenous heritage issues. This is reflected in Recommended Condition 7.

### 7.10 Community Advisory Committee and Community Involvement

Under the provisions of the TRESB Act, a Project Advisory Committee has been established and has had an ongoing role in the works to date including the dredging associated with Stage 1 of the works. Under the provisions of the Act, the Advisory Committee must comprise two officers from each State, one representative from Tweed and Gold Coast Councils and four community representatives. The role of the Committee is to give advice on a number of matters including the following:

- preparation of a plan of management
- management and implementation of the works
- issues of relevance to the local community

The Advisory Committee has proved to be an effective forum for allowing consultation with the local community. Representatives on the Advisory Committee include Tweed Shire and Gold Coast City Councils, surfing community, business community, environment groups and the commercial fishing industry. In accordance with the TRESB Act, the Advisory Committee's role will continue throughout Stage 2 of the project.

There are a number of other parties with whom ongoing consultation will be required during construction and operation of the works. These include the local Aboriginal community, NSW Fisheries, NPWS and commercial beach worm farmers. The extent of involvement of each of these groups will be dependent upon the selection of the preferred system. As such, a consultation strategy should be prepared following selection of the preferred system which identifies the relevant parties to be consulted and the most appropriate mechanisms for achieving this.

In addition to ongoing consultation with these interest groups, a program of broader consultation will need to be undertaken to ensure the local community is informed of the process and timing of the works and any likely impacts. This will best be achieved through the nomination of an appropriately qualified person who will be responsible for disseminating information to the community in the form of newsletters, signage, advertisements etc. and who will also be responsible for recording and handling complaints about the works. This requirement is reflected in Recommended Conditions 8 and 9.

## 7.11 Other Issues

### 7.11.1 Public Health Impacts

The EIS states that the proposed works may result in a greater area of breeding habitat being available over time for midge and mosquito species. However, further information supplied by the proponent indicates that the magnitude of the impact is expected to be very small compared with the overall tidal range change. As such, it is unlikely that the shift in range would represent an increase in breeding area that is significant in terms of public health. The Department agrees with this conclusion and no specific management measures are recommended.

### 7.11.2 Industrial/Commercial Use Of Sand

A number of representations stated that a proportion of the sand being retrieved by the bypassing system should be made available for use in the local construction industry. The Department agrees with the conclusion reached by the proponent that this would be contrary to the objective of the proposal and not in accordance with the provisions of the TRESB Act.

### 7.11.3 Access to Jetty Structure

The proponent has indicated that if a jetty system was selected as the preferred system, access to the structure would be provided to the public for recreational fishing and other appropriate activities. The Department recognises that if a jetty structure were to be constructed, its use by the public would most likely be inevitable and that as such it may be desirable to provide adequate facilities to protect the safety of users. However, the Department is concerned about the need for additional facilities such as car parking and lighting and the impact that this may have on the surrounding environment. No information is provided in the EIS with respect to the works that may be required. Any proposal to develop such facilities should not be part of the subject approval.

A separate environmental assessment would need to be undertaken for any ancillary works associated with public use of and access to the jetty structure.

### 7.11.4 Training Wall Stability

The EIS indicated that deepening of the entrance bar will mean that significantly fewer waves will break in the deepened areas and that the waves approaching the entrance and training walls will therefore have more energy. A bypassing system which maintained a deep entrance bar could expose the existing training walls to risk of sudden and severe failure during a major storm. In contrast, a system which resulted in a relatively shallow bar scenario may not significantly increase the risk of storm damage to the walls, however, this

would need to be confirmed by undertaking modelling following selection of the preferred bypass system.

The proponent has indicated that works to increase the strength of the training walls may be required depending on the system selected. However, it is not possible at this time to determine the timing and extent of training wall strengthening that may be required.

The Department endorses the proposed approach by the proponent to model the possibility of failure of the training walls following selection of a preferred system. Any strengthening works would be subject to a separate environmental assessment.

### 7.11.5 NSW Coastal Policy

The NSW Coastal Policy 1997 was developed to guide management and planning of the coastal zone of NSW. The study area is within the area covered by the NSW Coastal Policy. An assessment of the proposal has been undertaken in the context of the NSW Coastal Policy and the works have been found to be in keeping with the intent of the Policy. Specifically the objectives relating to minimising risks to human safety and recognising and accommodating natural coastal processes are in keeping with the project objectives.

# 8. CONCLUSIONS AND RECOMMENDATIONS

The Tweed River Entrance Sand Bypassing Works are being undertaken as part of a commitment between the Queensland and NSW state governments to improve navigation conditions at the Tweed River Entrance and improve the amenity of the southern Gold Coast beaches. The assessment undertaken by the Department has examined the EIS, the Representations Report and additional information provided by the proponent during the assessment process.

The need for and justification of the proposal is set out in the Tweed River Entrance Sand Bypassing Act 1995 which ratifies the deed of agreement made between the Queensland and NSW governments in relation to these works. As such, the assessment undertaken by the Department seeks not to reassess the justification of the proposal, but rather focuses on ensuring the works can be undertaken in an environmentally acceptable manner.

The assessment presented in the EIS was undertaken in such a manner as to allow the proponent maximum flexibility in selecting a bypass system that would most efficiently fulfil the project objectives. While the rationale for using this type of assessment is understood by the Department, this type of approach to environmental assessment where a blanket approval is sought for a range of options, should not be encouraged. This type of assessment detracts from the ability to gain a comprehensive understanding of the nature of the proposed works and the extent of the impacts. A better approach would be to undertake the assessment of a range of options at a strategic level prior to preparation of an EIS for a specific proposal.

In its assessment of the proposed works, the Department has examined the range of impacts attributable to the various bypass systems described in the EIS. The Department has concluded that provided the range of mitigation measures discussed in the report and reflected in the Recommended Conditions of Approval are implemented, the impacts of the proposal can be controlled to an acceptable level. The focus of the Recommended Conditions of Approval is on ongoing monitoring and consultation following selection of a preferred bypass system and during operation of that system. The management measures, which would be incorporated into Environmental Management Plans (EMPs) for the construction and operation stages of the works, have been developed to ensure that a flexible system is implemented which can respond to the changing needs in terms of material retrieval and delivery strategies.

# 9. RECOMMENDED CONDITIONS OF APPROVAL

*This Section provides the Department's recommended conditions of approval for the project under Section 115B(2) of the EP&A Act. These are based on the Department's assessment of the EIS, the representations made to the Department and supplementary information and advice provided.*

*It is noted that the EIS and Representations Report contain extensive information on procedures and mitigation strategies to be implemented to ameliorate impacts of the proposal. The recommended conditions of approval should therefore be implemented in conjunction with those procedures and mitigation measures specified in the EIS and the Representations Report (summarised in Appendix A of this report). Where there is an inconsistency with the recommendations in the EIS or Representations Report, the recommended conditions will prevail.*

The following abbreviations and acronyms are used:

| | |
|---|---|
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| Advisory Committee, the | Tweed River Entrance Sand Bypassing System Project Advisory Committee |
| Department, the or DUAP | Department of Urban Affairs and Planning |
| Director-General | Director-General of the Department of Urban Affairs and Planning (or nominee) |
| EIS | Environmental Impact Statement |
| EMP | Environmental Management Plan |
| EMR | Environmental Management Representative |
| EMS | Environmental Management System |
| EPA | Environment Protection Authority |
| LALC | Local Aboriginal Land Council |
| Minister, the | Minister for Urban Affairs and Planning |
| NPWS | National Parks and Wildlife Service |

**GENERAL**

1. The proposal shall be carried out in accordance with:

   (i) the proposal contained in the environmental impact statement (EIS) *Tweed River Entrance Sand Bypassing Project Permanent System* prepared for Department of Land and Water Conservation and Queensland Department of the Environment by Hyder Consulting Pty Ltd, Patterson Britton Partners Pty Ltd and WBM Oceanics Joint Venture, dated 24 June 1997, subject to any modifications to the proposal as described in Tweed River Entrance Sand Bypassing Project System Representations Report dated December 1997 (the Representations Report); and

(ii) all identified procedures, safeguards and mitigation measures identified in the EIS and Representations Report subject to the conditions of approval granted by the Minister.

Despite the above, in the event of any inconsistency with the proposal as described in the EIS and Representations Report, the conditions of approval granted by the Minister shall prevail.

2. For the purposes of this approval, the date of commencement shall be from the date that the proponent determines to proceed with the proposal. The proponent shall provide the Director-General with the date of commencement within 14 days of the proponent determining to proceed with the proposal.

**COMPLIANCE**

3. It shall be the ultimate responsibility of the proponent to ensure compliance with all conditions of approval granted by the Minister.

4. The proponent shall comply or ensure compliance with all requirements of the Director-General in respect of the implementation of any measures arising from the conditions of this approval. The proponent shall bring to the attention of the Director-General any matter that may require further investigation and the issuing of instructions from the Director-General. The proponent shall ensure that these instructions are implemented to the satisfaction of the Director-General within such time that the Director-General may specify.

5. The proponent must submit for the approval of the Director-General a compliance report concerning the implementation of all conditions of this approval. The compliance report must be submitted within three months of completion of construction, or as otherwise agreed by the Director-General.

**DISPUTE RESOLUTION**

6. The proponent shall endeavour as far as possible to resolve any dispute with relevant public authorities arising out of the implementation of these conditions of approval. Should this not be possible, the matter shall be referred to the Minister for resolution. The Minister's determination of the disagreement shall be final and binding on all parties.

**CONSULTATION REQUIREMENTS**

7. Following selection of a preferred option, the proponent shall develop a Consultation Strategy to the satisfaction of the Director-General. This Strategy shall be submitted to the Director-General two months before the commencement of construction. This Strategy shall contain the following:

i) details of the parties with whom the proponent is going to consult. Consultation shall be undertaken prior to commencement of construction and

thereafter on a regular basis. Parties to be consulted shall include but not be limited to the following; Tweed-Byron LALC, Pooningbah Aboriginal Corporation, commercial beach worm farmers, NPWS, NSW Fisheries

ii) details of the methods by which consultation is to take place and methods for recording the outcomes of consultations and resolving disputes

iii) details of procedures to address issues that arise from the consultations and means of recording that issues have been addressed

The Strategy and records of consultation shall be made available to the Director-General, the EPA, Tweed Shire Council and Gold Coast City Council upon request.

**COMMUNITY INFORMATION**

8. The proponent shall ensure that the local community is kept informed of the progress of the project by way of local newsletters, leaflets, newspaper advertisements and community notice boards as appropriate, including prior notice of:

i) the nature of works proposed for the forthcoming period
ii) a 24 hour contact telephone number during construction and at all times when the bypass system is operating
iii) any traffic disruptions and controls
iv) any beach access controls or restrictions
v) any navigation hazards or disruptions at the Tweed River entrance
vi) work required outside of the normal working hours
vii) individual's rights under the conditions of approval

**COMPLAINTS**

9. The proponent shall record details of all complaints received in an up to date log book and ensure that an initial acknowledgement is provided to the complainant within 24 hours and a detailed response provided within 10 days. Information on complaints received shall be made available on request to the Advisory Committee, all relevant government agencies, Tweed Shire Council, Gold Coast City Council and a summary included in the Environmental Monitoring Reports. The proponent shall nominate an appropriately qualified person with the responsibility to receive, log, track and respond to complaints within the specified timeframe.

**ENVIRONMENTAL MANAGEMENT SYSTEM**

10. The proponent shall ensure the appointment of contractors that have:

i) A demonstrated capability and experience in the implementation of an Environmental Management System (EMS) prepared in accordance with the AS/NZS ISO 14000 series or BS 7750-1994 and certified by an accredited certifier; and/or
ii) a proven track record in environmental management of projects of a similar magnitude

## ENVIRONMENTAL MANAGEMENT REPRESENTATIVE

11. A suitably qualified Environmental Management Representative (EMR) shall be available during construction activity at the site and be present on-site during any critical construction activities as defined in the Environmental Management Plan (EMP) for the construction stage works. The following information shall be provided to the Director-General:

    i) qualifications of the EMR and demonstration of compliance with AS/NZS ISO 14012:1996 'Guidelines for environmental auditing: Qualification criteria for environmental auditors';
    ii) role of the EMR which shall include responsibility for considering and advising on matters specified in the conditions of approval and compliance with such and facilitation of an induction and training program for all persons involved with the construction activities; and
    iii) authority of the EMR including details of the proponent's internal reporting structure. This shall include the authority to stop work immediately if an unacceptable impact on the environment is likely to occur or to require other reasonable steps to be taken to avoid or minimise any adverse impacts

    The EMR shall be approved by the Director-General prior to the commencement of construction.

## ENVIRONMENTAL MANAGEMENT PLANS

### Preparation of EMPs

12. The proponent shall ensure the preparation and implementation of project specific Environmental Management Plans (EMPs) for the construction and operation stages of the works. The EMPs shall:

    i) for all construction activities, be prepared and submitted to the Director-General for approval at least one month prior to the commencement of construction work on site in accordance with the conditions of this approval, the EIS and Representations Report, all relevant Acts and Regulations and accepted best practice management plans;
    ii) for operational activities, be prepared and submitted to the Director-General for approval at least one month prior to the commencement of operation of the system in accordance with the conditions of this approval, the EIS and Representations Report, all relevant Acts and Regulations and accepted best practice management plans;
    ii) be updated as required and when requested by the Director General. Any significant changes to the EMPs during either construction or operation shall be referred to the Director-General for approval; and
    iii) be made publicly available and copies of the current version supplied to the

Department, EPA, Tweed Shire Council, Gold Coast City Council and the Advisory Committee prior to commencement of construction, at the end of each six months during the construction period and annually during the operation of the bypass system, or upon request.

**Framework for EMPs**

13. The EMPs shall be prepared following consultation with relevant government agencies including EPA, NPWS, NSW Fisheries, the Advisory Committee, Tweed Shire Council and Gold Coast City Council. The EMPs shall include, but not be limited to, the following information:

    i) statutory and other obligations that the proponent is required to fulfil during project construction, including all approvals and consultations and agreements required from authorities and other stakeholders and key legislation and policies (including the NSW Coastal Policy) which control the proponent's undertaking of the project;
    ii) definition of the role, responsibility, authority, accountability and reporting of personnel relevant to the EMPs including the EMR and the person nominated to manage community liaison;
    iii) overall environmental management objectives and performance outcomes for each of the key environmental elements;
    iv) a detailed monitoring and reporting strategy for the construction and operation stages of the works;
    v) procedures to be followed where identified outcomes are not achieved including consultation with relevant agencies if required on additional mitigation measures;
    vi) steps to be taken to ensure all approvals, plans, procedures and strategies are being complied with;
    vii) consultation requirements with relevant government agencies; documentation of the results of consultation undertaken during development of the EMPs; and
    viii) community consultation and notification strategy and complaint handling procedures including arrangements to inform residents of works to be undertaken.

14. The EMPs shall include the following strategies for key environmental elements. The strategies shall be relevant to both the construction and operation stages of the project:

    i) Noise and Vibration Management Strategy (refer Condition 26)
    ii) Traffic Management Strategy (refer Condition 21)
    iii) Historic Shipwreck Management Strategy (refer Condition 28)
    iv) Waste Management Strategy (refer Condition 32)
    v) Water Quality Management strategy (refer Condition 31)
    vi) Flora and Fauna Management Strategy (refer Condition 39)

## ENVIRONMENTAL MONITORING REPORTS

15. The proponent shall submit three (3) monthly reports to the Director-General and the EPA on the results of monitoring commencing after the date of actual commencement of construction works at the site until the completion of construction and six (6) monthly during bypass operation for the first two years and annually after that or at any other period as determined by the Director-General. The reports shall include, but not be limited to, information on the following:

    i) any applications for consents, licences and approvals, and responses from relevant authorities during the reporting period;
    ii) implementation and effectiveness of environmental controls and conditions relating to work undertaken;
    iii) identification of impact predictions made in the EIS and other supplementary studies and details of the extent to which the actual impacts reflect the predictions;
    iv) details and analysis of environmental monitoring;
    v) assessment of compliance with Environmental Management Plan(s) for both construction and operation activities;
    vi) number and details of any complaints, including a summary of the main areas of complaint, action taken, response given and intended strategies to reduce complaints of a similar nature; and
    vii) any other matter relating to the compliance by the proponent with the conditions of this approval, or as requested by the Director-General.

    Copies of these reports shall be submitted at the same time to the Director-General, EPA, NSW Fisheries, NPWS and the Advisory Committee and be made available to the public on request.

## ENVIRONMENTAL AUDITS

16. Environmental audit reports shall be submitted to the Director-General, the EPA and any other relevant authority:

    i) at the completion of construction

    ii) annually for the first two years of operation

    iii) at five year periods thereafter during operation

    iv) at any other period required by the Director-General

    The audits shall be carried out by an independent person agreed to by the Director-General at the proponent's expense and shall assess the impacts relating to the proposal and the adequacy of safeguards and mitigation measures. The audits shall review all impact predictions made in the EIS and supplementary studies and detail the extent to which the actual impacts reflect the predictions. The compliance of the proponent with these conditions of approval including the implementation of the

Environmental Management Plan shall also be assessed. Results of the consultation with the community and other relevant stakeholders shall also be included. The proponent shall comply with all reasonable requirements of the Director-General, the EPA or any other relevant authority with respect to the measures arising from, or recommendations by, the audits.

**ENVIRONMENTAL MONITORING REQUIREMENTS**

17. As part of the Environmental Management Plan referred to in Conditions 12 and 14, a detailed environmental monitoring program for the construction and operation stages of the works shall be developed. The monitoring program shall be based on the commitments contained in Table 8.5.1 of the EIS and shall include, but not be limited to, monitoring of the following parameters:

    i) Duranbah surf quality and beach amenity;
    ii) Tweed River Entrance bathymetric conditions;
    iii) wetland distribution and health determined through the use of aerial photography and periodic quadrant sampling if required;
    iv) beach morphology and encroachment into currently stabilised dunal areas at Letitia Spit;
    v) training wall stability; and
    vi) condition of Lower Estuary Marine Shoals and compliance with Lower Estuary Marine Shoals Management Plan.

**CONDITIONS OF CONTRACT**

18. All Conditions of Contract imposed by the proponent shall also form part of this condition of approval. Where there is an inconsistency between the conditions of contract and these conditions of approval, these conditions shall apply.

**NOTIFICATION OF SELECTED BYPASS SYSTEM**

19. Following selection of a bypass system and prior to commencement of construction, the proponent shall notify the Director-General of the bypass system and shall demonstrate to the satisfaction of the Director-General that the selected system is within the parameters of these conditions of approval. This notification shall be provided within one (1) month of the selection of the preferred system.

**NOTIFICATION OF CHANGE OF BYPASS SYSTEM**

20. Six (6) months prior to decommissioning of an existing bypass system, the proponent shall notify the Director-General of the new system to be implemented and demonstrate to the satisfaction of the Director-General that it is within the parameters of these conditions of approval.

**TRAFFIC AND ACCESS**

21. As part of the EMPs referred to in Conditions 12 and 14, the proponent shall ensure that a Traffic Management Strategy is prepared for the construction and operation

stages of the works, unless a mobile water based system is implemented as the sole means of undertaking the works. The Strategy shall be prepared in consultation with Tweed Shire Council and shall include:

i) details of construction and operation vehicle numbers;
ii) proposed traffic routes to minimise disruption to residential land use;
iii) examination of the need to upgrade site access roads;
iv) details of community notification strategies; and
vi) details of procedures to be implemented should any damage to access roads occur as a result of construction or operation traffic.

**LANDSCAPING AND VISUAL**

22. The proponent shall ensure that all on-site lighting is screened or directed away from residences.

23. The proponent shall ensure that structures are of material and colours which are sympathetic to the surrounding environment.

24. Permanent pipelines shall be buried where possible and shall be painted an appropriate colour to minimise visual intrusion where burial is not possible.

25. The proponent shall prepare a landscaping plan for disturbed areas which shall incorporate the use of native species. The plan shall be prepared in consultation with Tweed Shire Council.

**NOISE AND VIBRATION MANAGEMENT**

26. As part of the EMPs referred to in Conditions 12 and 14, the proponent shall prepare in consultation with the EPA, a detailed Noise and Vibration Management Strategy. The Strategy shall provide details of noise and vibration control measures to be undertaken during construction and operation and shall reference environmental issues and goals set out in the relevant EPA guidelines.

The Strategy shall include, but not be limited to:

i) anticipated airborne noise and vibration for all major noise and vibration generating activities, including traffic movements, and locations and duration of these activities;
ii) location, type and timing of implementation of any specific physical and managerial measures for controlling noise and vibration;
iii) noise and vibration control equipment to be fitted to machinery;
iv) predicted noise and vibration levels at sensitive receivers;
v) noise and vibration monitoring and reporting procedures;
vi) measures for dealing with exceedances;
vii) arrangements to inform residents of construction or operation activities likely to affect their noise amenity;
viii) contact point for residents; and
ix) complaints handling systems including reporting of complaints and response

actions.

The Strategy shall be prepared prior to construction and shall be made publicly available.

27. All construction activities (with the following exception) including entry and departure of heavy vehicles shall be restricted to the hours 7.00am to 6.00pm Monday to Friday and 8.00am to 1.00pm Saturday with no work to be undertaken on Sundays and Public Holidays. Works outside these hours which may be permitted include:

i) any works which do not cause noise emissions to be audible at any nearby residential property;
ii) the delivery of materials which is required outside these hours requested by NSW Police or other authorities for safety reasons;
iii) emergency work to avoid the loss of lives/property or damage to the environment; and
iv) any other work as approved by the EPA.

**HISTORIC SHIPWRECK MANAGEMENT STRATEGY**

28. As part of the EMPs referred to in Conditions 12 and 14, the proponent shall ensure a Historic Shipwreck Management Strategy is prepared by a suitably qualified specialist in consultation with the NSW Heritage Office. The Strategy shall:

i) outline further investigations that may be required to confirm the location of any historic shipwreck sites based on the results of earlier remote sensing and the construction and operating parameters of the selected bypass system;
ii) contain a detailed strategy to be implemented to protect or retrieve any identified sites during construction or operation;
iii) contain a detailed strategy to be implemented if any potential sites are discovered during construction or operation; and
iv) identify statutory requirements under the Historic Shipwrecks Act 1976, NSW Heritage Act 1974 and the Navigation Act 1901.

**AIR QUALITY**

29. The proponent shall:

i) undertake dust suppression measures, including use of water trucks, water spraying of activity areas and roads, covering or protecting stockpile sites, ensuring all trucks leaving the site are covered and undertaking revegetation of disturbed areas;
ii) ensure all equipment is fitted with appropriate exhaust control measures; and
iii) ensure that dust generation along the access road to Letitia Spit is managed to an acceptable level.

**SOIL AND WATER MANAGEMENT**

30. Prior to commencement of construction, an assessment of the potential for disturbance of acid sulphate soils or potential acid sulphate soils shall be undertaken along the

pipeline routes and other relevant areas in accordance with '*Acid Sulphate Soils - Assessment and Management Guidelines (Draft)*' (ASSMAC, 1997). If required, a management plan shall be prepared to the satisfaction of the EPA.

31. As part of the EMPs referred to in Conditions 12 and 14, the proponent shall prepare a Water Quality Management Strategy which outlines the proposed mitigation measures to be implemented during construction and operation stages of the works. The strategy shall contain procedures to be implemented in the case of accidental spillages.

**WASTE MANAGEMENT**

32. As part of the EMPs referred to in Conditions 12 and 14, the proponent shall prepare a Waste Management Strategy that details how waste material will be managed to ensure reuse, reprocessing or recycling is maximised and how any remaining waste will be disposed of. This condition applies to all stages of the project, including decommissioning of the bypass system.

**UTILITIES AND SERVICES**

33. The proponent shall ensure the diversion, protection or support of services and utilities affected by the construction activities, in consultation with the relevant service authorities. Any alterations to utilities and services shall be carried out to the satisfaction of the relevant authority(s) and, unless otherwise agreed to, at no cost to the service authority.

34. The proponent shall be responsible for minimising any disruption to services resulting from such work and shall be responsible for advising affected people prior to disruption to services.

**INDIGENOUS HERITAGE**

35. All construction activities shall be undertaken in a manner which avoids disturbance to the following areas as identified in Figures 3 and 5 in *'A Cultural Heritage Assessment of the Terrain to be Impacted by the Proposed Tweed River Entrance Sand Bypassing Project'* (Davies, 1997):

    i) soak on Letitia Spit ( Location 2);
    ii) unquarried portion of rock at Point Danger (Location 3); and
    iii) rocky knoll behind Duranbah Beach (Location 4).

36. If any potential archaeological remains are identified during construction or operation activities, the proponent shall immediately contact NPWS, Tweed-Byron Local Aboriginal Land Council and the Pooningbah Aboriginal Corporation and the appropriate action shall be taken under the National Parks and Wildlife Act 1974.

## LOWER ESTUARY SHOALS MANAGEMENT PLAN

37. The proponent shall consult with Tweed Shire Council and other relevant parties to develop a Lower Estuary Shoals Management Plan prior to the commencement of operation of the bypass system. The Plan, which must form part of the Tweed River Management Plan, shall include procedures and responsibilities for maintaining and protecting the Lower Estuary Shoals. The proponent's specific responsibilities in the Plan shall include maintenance of the shoals following major flood events.

## SAND RETRIEVAL AND DISCHARGE STRATEGY

38. Following selection of a preferred bypass system, the proponent shall prepare a Sand Retrieval and Placement Strategy. This Strategy shall include, but not be limited to the following:

    i) comprehensive description of the selected bypass system including retrieval, transfer and placement methods
    ii) detailed discharge strategy including a discussion of both temporary and permanent discharge locations and volumes
    iii) discussion of procedures to be implemented to determine events when discharges will be made at locations other than the primary location (ie. Duranbah, Snapper Rocks west) and the method of calculating discharge volumes at these times
    iv) measures to be implemented during and after storm events
    v) detailed discussion of frequency and timing of discharge events including procedures to ensure discharges are scheduled to minimise disruption to beach areas
    vi) detailed Duranbah Surf Quality Management Strategy to be prepared in consultation with the local surfing community to minimise the impacts of the works on surf conditions at Duranbah Beach

    Copies of the Strategy shall be provided to the Director-General, Tweed Shire Council, the Advisory Committee and be made publicly available on request.

## FLORA AND FAUNA MANAGEMENT

39. Prior to the commencement of construction works, the proponent shall prepare, to the satisfaction of the Director-General and in consultation with NPWS, a Flora and Fauna Management Strategy for the proposed works. The Strategy shall take into account, as advised by NPWS, any draft or final recovery plan for the Little Tern. When any such draft recovery plan is finalised, the proponent shall review and if necessary update the Flora and Fauna Management Strategy to implement any relevant recommendations of the recovery plan. The Strategy shall include, but not be limited to the following:

i) consideration of the need to schedule construction activities in the vicinity of South Head Beach to take into account the migratory habits of avifauna species using the area;

ii) measures to enhance roosting and nesting habitat for Little Terns on South Head Beach beyond the southern limit of the bypass system infrastructure including provision of suitable substrate for nesting areas. These measures should be developed in conjunction with the Local Aboriginal Land Council and the Little Tern Recovery Team at National Parks and Wildlife Service;

iii) monitoring of effectiveness of any roosting or nesting habitat provided at South Head Beach (refer (ii) above) and if nesting is detected, development of management measures to enhance potential nesting success as discussed on Page 33 of the '*Tweed Entrance Bypass Threatened Avifauna Assessment*' (WBM Oceanics, 1997);

iv) details of a public education campaign to be developed and implemented in conjunction with Council informing users of the South Head Beach area of its importance as habitat for bird species. At a minimum this must involve signage at key beach access points and provision of information to Tweed Shire Council suitable for inclusion with permits for four wheel drive operators on South Head Beach;

v) consideration of the need to implement any measures to physically protect Little Tern habitat on South Head Beach that may be physically affected by construction works;

vi) procedures for monitoring the changes to the tidal regime in the Lower Tweed Estuary and measures to be implemented if impacts on avifauna species are found to be significant;

vii) measures to increase colonisation of Letitia Spit by native flora and fauna;

viii) dune management measures to be implemented; and

ix) identification of any required management measures to control the spread of weeds or feral fauna attributable to the construction or operation of the bypass system.

40. Construction and operation of any works associated with the bypass system that may affect the South Head Beach area are not to be undertaken in conjunction with any works to be carried out at Tony's Bar including the dredging works proposed in that location by Tweed Shire Council.

41. For those bypass systems defined as Category 3 systems in the '*Tweed Entrance Bypass Threatened Avifauna Assessment*' (WBM Oceanics, 1997), namely those systems involving a fixed infrastructure with sand intakes located across the nearshore zone, with pump stations/head quarters located landward of the foredune, all infrastructure and any significant disturbance must be contained within 1000m of the southern breakwater of the entrance of the Tweed River.

42. For those bypass systems defined as Category 2 or Category 4 systems in the '*Tweed Entrance Bypass Threatened Avifauna Assessment*' (WBM Oceanics, 1997), namely those systems involving mobile land based systems which extract sand from the beach, berm and immediate near-shore areas and which may include delivery pipes across or buried under the beach and dune, all infrastructure and any significant disturbance must be contained within 500m of the southern breakwater of the entrance of the Tweed River.

**Notes:**

1. **These conditions do not relieve the proponent of its obligations to obtain all other approvals and licences from all relevant authorities required under any other Act. Without affecting the generality of the foregoing, the proponent shall comply with the terms and conditions of such approvals and licences.**

2. **Any modification to the proposal which would be inconsistent with the conditions of approval shall only be carried out with the prior approval of the Minister.**

# 10. REFERENCES

1. Davies Heritage Consultants Pty Ltd (1997). A Cultural Heritage Assessment of the Terrain to be Impacted by the Proposed Tweed River Entrance Sand Bypassing Project.

2. Department of Land and Water Conservation & Queensland Department of Environment (1997a). Tweed River Entrance Sand Bypassing Project Permanent Bypassing System - Representations Report.

3. Department of Land and Water Conservation & Queensland Department of Environment (1997b). Tweed River Entrance Sand Bypassing Project Stage 2 Permanent Bypassing System - Call for Proposals Main Document.

4. Hyder Consulting, Patterson Britton and Partners & WBM Oceanics Australia (1997). Tweed River Entrance Sand Bypassing Project - Permanent Bypassing System: Environmental Impacts Statement/Impact Assessment Statement Prepared for Department of Land and Water Conservation and Queensland Department of Environment.

5. NSW Government (1997). NSW Coastal Policy 1997.

6. WBM Oceanics Australia (1997). Tweed River Entrance Threatened Avifauna Assessment.

# *APPENDIX A*

*PROPOSED ENVIRONMENTAL MANAGEMENT MEASURES*

## MITIGATION MEASURES PROPOSED IN EIS

### Navigation of Tweed River Entrance

- monitoring of the entrance conditions in the River channel
- monitoring of the channel bathymetry
- daily observations of navigational conditions by Point Danger Air Sea Rescue including record of location, depth and width of navigational channel and distribution of sand shoals
- ongoing consultation through Community Advisory Committee with regard to the navigational conditions

### Sand Dredging and Snapper Rocks Discharge Strategy

- develop strategy to establish a discharge reserve at Snapper Rocks to cater for storm periods
- performance criteria to control sand intake/entrance channel maintenance and the discharge strategy for Snapper Rocks including specification of circumstances under which the sand discharge location may be changes to Kirra, west of Snapper Rocks or Duranbah
- monitoring of the Snapper Rocks sand reserve and adjacent beach conditions to determine appropriate discharge locations during periods of local northeast sea waves
- ensure bypass design includes provision for direct discharge to primary discharge at Snapper Rocks (Frogs Beach), west of Snapper Rocks and Kirra
- monitoring of continuous directional wave data from the existing Tweed wave recording station and daily observations of beach, shoal and surf conditions

### Intermittent Sand Discharge Scheme

- for conventional trailer suction dredger systems, sand deposited within the nearshore nourishment zone should not exceed 300,000$m^3$
- monitoring of nearshore shoals in the vicinity of Snapper Rocks with periodic hydrographic surveys and aerial photographs
- performance criteria to be set to control quantities of sand discharged to nearshore nourishment zone to achieve the objective of not exceeding the natural variability of shoals in the area

### Storm Period Operation

- develop strategy for dredging during storm periods dependent on type of system selected and examine need for additional dredging by mobile plant to be examined if fixed system selected as the preferred option

### Kirra Discharge

- strategy to undertake periodic discharge to Kirra Beach by means of subaerial placement or placement in the longshore transport system

**Letitia Spit**

- dune vegetation management strategy required
- specific management controls to limit adverse effects on the dune system and its habitat if a sand trap area within the present shoreline is implemented

**Duranbah Discharge**

- develop strategy for Duranbah discharge which identifies the primary objective (viz. beach condition or surfing conditions) and determine appropriate discharge strategy

**Future Management of Lower Estuary Marine Shoals**

- no further environmental management provisions additional to those recognised in the Tweed Estuary Management Plan would be required

**Duranbah Surf Quality Management**

- detailed strategy for surf quality management considering the practicality and cost implications of any such nourishment in the context of the specific capabilities of the successful bypass scheme
- detailed numerical process modelling could be used to develop a strategy suited to the adopted system
- development and refinement of the strategy undertaken through the Community Advisory committee
- identify possibilities for nourishment to be timed to suit surfing competitions and periods of the year with possibility of good swell

**Tweed Entrance Training Wall Stability**

- based on the system selected and the resultant risk of wall failure, develop a strategy to determine whether strengthening of the walls is required
- any strengthening would be subject to a separate environmental assessment process

**Aboriginal Heritage**

- *archaeological survey along the pipeline route in consultation with Tweed Byron LALC and relevant authorities*
- *obtain permits from NPWS id required for further testing*
- *depending on the results of the survey, undertake salvage excavation or re-routing of pipeline may be necessary*

**Maritime Heritage**

- report any maritime heritage items identified during works to Heritage Office
- if substantial archaeological remains are encountered during works, works will be moved elsewhere and further inspection of the item undertaken

- all occurrences of wrecks must be reported to the Receiver of Wreck for NSW under the Navigation Act 1912
- bypassing operators to be briefed on the nature of shipwrecks in the area and the procedure to be followed should an item be located
- contact details for Heritage Office archaeologists to be provided

**Ecology of the Tweed River Entrance**

- *planning should be undertaken in conjunction with Council to ensure that simultaneous disturbance at two of the three of the following roosts; South Head beach, Kerosene Inlet and Tonys Bar, does not occur*
- *removal of Tonys Bar as proposed by Council should precede or follow the construction of the system by 12 months*
- *fencing to be constructed to protect habitat*
- *scheduling of more disruptive works during the winter months ( late April to early August)*

**Kirra Reef**

- definition of exclusion zone around Kirra Reef in the order of 50m from any portion of the outcrops

**Noise**

- construction activities to be undertaken within defined construction hours as far as possible
- trucks not to pass through residential areas outside defined construction hours
- access roads to construction sites should be maintained in good condition
- trucks to be fitted with efficient mufflers
- mechanical plant to be fitted with exhaust mufflers
- monitoring of construction noise particularly for construction activity in areas closely adjacent to residential areas
- all maintenance activities to be undertaken within defined hours and within appropriate criteria
- undertake further monitoring at sensitive sites to confirm background noise levels
- vibration levels from bypass equipment to be imperceptible at adjacent habitable areas
- monitoring of noise during operation

**Monitoring Program**

*Monitoring of Coastal and Estuary Processes*

- monitoring of bathymetry of entrance channel and entrance bar including regular hydrographic surveys
- monitoring of condition of walls, deepwater wave heights and bar bathymetry during first few years of operation to determine need for strengthening measures

and then ongoing monitoring at a lesser frequency to determine the effectiveness of any measures implemented

- monitoring of southern Gold Coast beaches including:
  - sand bypass quantity and performance
  - simple beach and surf condition observation
  - detailed beach and bathymetric surveys
  - directional wave recording
  - continued assessment of longshore transport regime
  - regular aerial photography
  - community feedback
- monitoring of sand quantities bypassed covering the area from Fingal to Currumbin. A systematic common survey grid or profile system should be used. Suggested timing:
  - annually for first 5 years
  - bi-annually over the next ten years
  - reviewed thereafter
- monitoring of beaches by low cost observation procedures similar to those used in the Queensland COPE program including:
  - Letitia Spit
  - Duranbah
  - Snapper Rocks/Rainbow Bay
  - Greenmount
  - Kirra
  - Kirra Central
  - North Kirra
- monitoring of longshore transport indicators through use of Tweed directional wave recorder
- community feedback through local surf lifesaving clubs and local surfing representatives

*Duranbah Surf Quality Management*

- development of a detailed numerical model of the Duranbah Shoals and entrance bar to predict wave transformation and sediment transport
- basic wave transformation models to be used to generally predict waves approaching the site and make relative assessments of wave transformations over the shoal
- model that incorporates wave breaking, non-linear wave shoaling and finite heights effects on wave velocity near the surf zone is required to reasonably predict wave breaking over a surf site
- monitoring of conditions at Duranbah including:
  - regular surf quality assessments
  - regular hydrosurveys of nearshore shoals
  - regular hydrosurveys of entrance bar bathymetry
  - regular aerial photography

*Lower Estuary Marine Shoals Monitoring*

- regular hydrosurveys of lower estuary
- ongoing water level recording in the estuary
- aerial photographs

*Wetland Distribution*

- baseline data collection upon commencement of construction
- monitoring of seagrass, mangrove and saltmarsh communities using aerial photography

**Schedule of Monitoring for first Ten Years of Operation**

| MONITORING ACTIVITY | PRE-CONSTRUCTION ACTIVITY AND FREQUENCY | POST-CONSTRUCTION ACTIVITY AND FREQUENCY |
|---|---|---|
| *Beach Management Nourishment Strategy* | | |
| surf surveys | monthly during season | monthly during season |
| sand bypass quantity measurement | NA | yes |
| beach and offshore surveys | once | annually for 5 years then bi-annually |
| directional wave measurement | continuous | continuous |
| longshore transport assessment | annually | annually |
| aerial photography | six monthly | 6 monthly for first 5 years then annually |
| community feedback | ongoing via Cttee | ongoing via Cttee |
| *Duranbah Surf Quality Management* | | |
| directional wave measurements | included in above | |
| regular surf quality assessment | included in above | |
| beach and offshore survey | included in above | |
| entrance bar surveys including entrance channel | included in above | 3 monthly first 6 years then 6 monthly |
| aerial photography | included in above | |
| *Lower Estuary Marine Shoals Management* | | |
| estuary hydrosurveys | 6 monthly | 6 monthly first 5 years then annually |
| aerial photographs | included in above | |
| *Training Walls Stability* | | |
| storm damage survey | annual | annual |
| wave measurements | included in above | |
| entrance bar surveys | included in above | |
| *Wetland Distribution* | | |
| wetland extent | 6 monthly first 5 years then annually | |

## *APPENDIX B*

*SUMMARY OF ISSUES RAISED IN REPRESENTATIONS*

# 2 Submissions Received

The following summaries identify each issue raised in each of the submissions. The summaries are included here for referencing purposes, and are not intended to substitute for the greater detail provided in the submissions themselves which can be referenced in Appendix A. The responses to the submissions contained in Section 3 are based on the full submissions.

The system of referencing used is as follows, taking the first submission as an example:

- "1" means the submission number on a register of submissions compiled;
- "QLD" is the State from which the submission originated;
- "Air Sea Rescue Point Danger" is the writer of the submission;
- "31.7.97" is the date shown on the submission.
- "1.1" means Submission 1, Issue 1.

## 2.1 Summary of all Issues Raised

### 1 QLD Air Sea Rescue Point Danger (31.7.97)

1.1 Proposal freely supported as it is important to ensure that the Tweed River entrance is safe and navigable to prevent loss of life.

1.2 Major concern is the navigation hazard associated with dredging.

### 2 NSW Mineral Resources NSW (24.7.97)

2.1 The EIS did not address [redacted] recovery of dredged material for use as construction material. The EIS did not consider potential for even small quantities of sand to be diverted for local construction industry. If this possibility is to be considered, planning should take into account the need for stockpile sites and associated haulage routes.

## 3 NSW NSW EPA (29.7.97)

3.1 Water pollution control

Comments limited to pollution control aspects in line with legislative responsibilities, recommend liaison with DLAWC, NPWS and NSW Fisheries regarding wetlands, saltmarsh and seagrasses.

Agree with assessment made in Section 7.1.4 of the EIS that water quality impacts should be minimal.

If a substantial storm event occurred before the implementation of the permanent bypass system, stage 1 area may need to be dredged again. This may lead to an increase in water turbidity so a contingency plan is recommended for this scenario.

Do not believe that any of the sand bypassing options considered in the EIS will cause significant water pollution problems as long as conventional pollution control measures are implemented and the clean sand is dredged and discharged under controlled conditions.

3.2 Noise pollution control

Agree with the need to keep noise levels generated by night-pumping inaudible at residential premises.

3.3 Air pollution control

Do not consider there is the potential for excessive emissions from land-based operations however, there is a need to ensure that air emissions from stationary equipment, plant and dredges comply with the relevant Clean Air Legislation.

3.4 Statutory requirements

An approval under Section 17 of the Pollution Control Act may be required from the NSW EPA, with formal EPA approval required if the proposed dredging will include the installation of ponds or other pollution control equipment for the treatment of wastewater in NSW. The dredge operator will also need to apply for a Pollution Control Licence, if dredging has the potential to cause water pollution.

## 4 QLD [redacted] (30.7.97)

4.1 The amount of money spent and number of accidents in the area is a disgrace.

4.2 Recommends to move the Tweed River outlet so that it runs out past Danger Point in a northerly direction, remove the north wall of the present outlet and take about 20 metres off the present south wall.

**5 QLD [redacted] (6.8.97)**

5.1 Prefers option OV-3 in conjunction with option FX-3 for constant sand flow and stability of Letitia Spit, as well as relatively better environmental effects.

5.2 Recommends back-up refining of stage 1 and 1a to improve surf at Duranbah Beach.

5.3 Recommends all outlets be valved for control and outlet 1 be positioned 1/3 from the far sea end of the North Tweed River; outlet 2 positioned at Frogs Beach and outlet 3 positioned at the end of the Miles Street groyne.

5.4 Recommends all pipeline routes be sub-surface.

**6 QLD Snapper Rocks Surfriders Club (11.8.97)**

6.1 Supportive of positive attempts to improve navigational safety across the Tweed Bar.

6.2 Contend that a third objective of the TRESBP - Stage 2 should be maintaining the surf quality and consistency at Duranbah. In turn, local economy affected by surf quality.

6.3 Section 1.5 of the EIS/IAS. The Need for Action. The maintenance of Duranbah as Australia's most consistent surf break should be acknowledged in this section.

6.4 Would like to stress the importance to surf quality of having sand placement follow the rock and beach line and that wide banks are detrimental to surf quality.

6.5 In Section 4.6.6.3 of the EIS/IAS, Beach Recreation, the sentence "sub optimum .....quality" has caused much consternation among the general surfcraft riding population.

6.6 Section 4.6.6.6, Tourism, notes the popularity of surfing locally and the extensive economic benefits which result from surfing.

6.7 In relation to Section 5.2.1.2, Nourishment Areas:

Recommend that Stage 1B dredging and nourishment be carried out between months of August and November and that nourishment be directed towards the western sides of both of Kirra's groynes and placed in the subaerial zone against the rocks and along the beach.

Recommend that the primary outlet for Stage 2 nourishment be a subaqueous outlet located in the Point Danger/Frog Beach Zone.

Requested that more than 10% of production rates be directed to Duranbah, deducted from Frog Beach percentage but later redirected there by natural processes.

Permanent outlet requested on western side of Miles Street groyne.

6.8 Section 5.5.2.2 of EIS/IAS, Fixed System, FX-3. This system is preferred, preferably at least 500 metres south of the southern breakwall, on the basis of confidently providing efficient performance, possible localised fair surfing conditions and relative environmental benefits.

6.9 Section 7.2.1 of EIS/IAS, Overview of Impacts on Beach System. Increased beach width should be limited in balance with natural depth contours around the headlands.

6.10 Section 7.2.2, Sand Discharge at Snapper Rocks

Over supply of sand to the 8m seabed contour and the shoreline around Snapper Rocks would smother the "natural valve" of this area and would choke the sand supply to Coolangatta's beaches.

A smothered area east of Snapper Rocks would have a detrimental effect on sand placement in the area. It is recommended that a " sensitively placed subaqueous outlet with flexible production rates would prevent this."

6.11 Section 7.2.3.2 Specific Beach Impacts - Duranbah

It is considered that severe erosion to Duranbah would result if the system was implemented. The occurrence of very recent erosion at the beach was reported.

Recommend that by implementing recommendations concerning flexibility of production rates and outlet location, this will avoid the "worst case scenario."

6.12 Consider that the EIS underestimated the socioeconomic impacts if surf and beach conditions at Duranbah were adversely affected, especially as Duranbah is regarded as one of the most consistent surf breaks in the world.

6.13 Section 7.2.3.3 Southern Gold Coast Beaches - Kirra

State that previous attempts (including Stage 1A of this project) to nourish Kirra Point and Beach have not fulfilled this objective.

The surf break at Kirra is due to a sensitive relationship between the underlying volcanic rock bed and the build up of sand over it at a critical contour so that an oversupply or under-supply of sand will adversely affect surf quality unless an outlet off the end of Kirra groyne is installed.

6.14 The surf quality at Kirra should be included as an objective of the operational strategy of the project.

6.15 Section 7.2.3.3 Coolangatta Creek/North Kirra

Believe that the location of the Kirra Beach outlet is unnecessary and would have a detrimental effect on the waves at Kirra.

Recommend a permanent outlet on the western side of the Miles Street groyne which would serve the two purposes of replenishing eroded beach

between the Miles Street groyne and Coolangatta Creek as well as serving as a distribution point for 'excess' sand.

6.16 Section 7.6.4, Business Recreation and Tourism

Suggestion for two riser/hydrant types of outlets be adopted due to the uncertainty of how Duranbah will be affected.

The EIS fails to differentiate between the two types of wave breaks including the long smooth peel at Snapper Rocks, Rainbow Beach and Greenmount, and the long pitching peel at Kirra.

Storm surges adversely affect existing sand bars at most beaches while at Kirra they are usually enhanced.

Too much wide sand at Kirra will have a detrimental effect on surf quality.

Propose a riser/hydrant type outlet at Greenmount Beach.

Propose that the best location for an outlet to nourish Kirra Point and Kirra Beach is directly in line with the end of the big groyne.

6.17 Section 8.3.2.7, Kirra Discharge. Recommend more flexibility with production rates and outlet locations. Acknowledge that monitoring of conditions at Kirra is vital.

6.18 Section 8.3.2.9, Duranbah Discharge. Stated that Tweed Shire Council acknowledge that Duranbah is mainly a surfing beach due to the presence of treacherous rips and dangerous undertows, therefore the sand discharge strategy for Duranbah should relate primarily to surfing.

6.19 Section 8.3.5, Duranbah Surf Quality Management. Agree that the "development/refinement" of Duranbah Surf Quality Management be done through the Community Advisory Committee and that Snapper Rocks Surfriders Club Inc. accept responsibility for being part of the strategy development and monitoring teams.

6.20 Section 8.5.1.2, Beach Management and Nourishment Strategies. Agree that "optimal nourishment strategies" are desirable and attainable and will continue to work closely with authorities in this regard.

6.21 Section 8.5.1.3, Duranbah Surf Quality Monitoring. The proposal of Snapper Rocks Surfriders Club would dovetail nicely with " a strategy based on trial and error."

6.22 Section 8.5.1.6 Monitoring Costs. Snapper Rocks Surfriders Club offers their services as community consultants, reimbursed through the monthly surf monitoring fee.

6.23 It is considered that maintenance of the beaches, not replenishment, is required. At the time of writing, sand placement on Southern Gold Coast beaches is optimum (excluding Kirra Point).

6.24 Various businesses as listed below expressed their support for the Snapper Rocks Surfriders Club proposal and recommendations:

"Double Keg" Surfshop

DHD Surfboards

Brothers Neilsen

Kirra Surfriders Club

Pipedream Surfboards

Coolangatta Surf

Mt Woodgee

Quicksilver

Surfing Australia

Billabong

## 7 QLD Gold Coast City Council (12.8.97)

7.1 Recommend further explanation of the Tweed River Entrance shoals and lower estuary would be helpful.

7.2 The potential impact on Kirra Reef does not appear to be highlighted. Section 4 should be expanded to include details of the existing situation and Section 7 expanded to highlight the expected impact, ie more sand equals less reef.

7.3 While Council's requirements regarding the construction of pipelines and booster pumping stations are adequately addressed in Section 7.6.1, the issues of safety and visual amenity of the discharge points do not appear to have been addressed.

7.4 Central Kirra Beach (west of Miles Street groyne) will require beach replenishment in the short term, therefore a discharge outlet should be provided at this location.

## 8 QLD Queensland Department of Primary Industries (12.8.97)

8.1 Generally satisfied with level of detail and assessment and proposed management of fisheries interests.

8.2 Temporary options rather than fixed jetties and pipelines are considered to have the least environmental impact to fisheries interests.

8.3 Support options that minimise impacts other than temporary turbidity and restriction of fishing activities.

8.4 Support the use of mobile water-based systems where possible, however these may coincide with commercial beach fishing activities when weather is favourable.

8.5 A high priority should be given to prevention of disturbance of whiting or mullet fisheries. Do not support fixed systems with significant infrastructure which may deter estuary use by commercial species.

8.6 Should consider using a mobile trailer'suction dredger with deposition via an on-board sand slurry pipeline.

8.7 The EIS contained little information on the extent of marine vegetation likely to be impacted. DPI support careful monitoring of the health of mangrove, salt marsh, and other tidal vegetation and may be contacted for advice regarding baseline monitoring of wetland distribution.

8.8 DPI has no objection to the proposed Kirra Reef exclusion zone being defined as 50m away from any portion of the outcrops.

8.9 DPI do not support any use of tidal lands for construction compounds, car parking facilities or other support infrastructure. Any system utilising stockpiling of plant and equipment would require appropriate stockpiling sites which fully contain the spoil and prevent any runoff impacts on tidal lands.

8.10 Careful consideration should be given to the use of lower estuary sand in beach nourishment.

8.11 It is noted that timing of construction activities have been recommended so as not to affect migratory shorebirds but DPI also request that consideration be given to timing which reflects commercial net fisheries such as mullet.

8.12 The EIS only contained selected comments from QCFO whereas DPI usually requests that full written comments are provided in the EIS.

- The 'Queensland Department of Primary Industries - Division of Fisheries and Wetlands' was noted under Section 1.2.11 as "no formal reply'. This is now called "Queensland Department of Primary Industries, Fisheries and Forestry - Fisheries Business Group." The Fisheries Business Group usually provides comments through the Southern Fisheries Centre who has a reply listed in Section 1.1.10.

8.13 DPI would be pleased to review the detailed EMP when the system option is finalised.

8.14 A Section 51 Permit from the chief executive of the DPI is required for the disturbance, removal or destruction of marine plants which are protected under the provisions of the Fisheries Act 1994.

## 9 NSW NSW National Parks and Wildlife Service (12.8.97 and 14.8.97)

9.1 A number of ameliorative and monitoring measures proposed in the determination report of Stage 1A were to be carried out in consultation with the NPWS. The NPWS however, is not aware that any of these measures proposed have been carried out and requests advice on the progress of these measures.

9.2 The NPWS concurs with the conclusion of the flora and fauna assessment that the proposed activity is likely to have a significant effect on threatened species and accordingly, NPWS understands that a Species Impact Statement will be prepared prior to determination of the proposal.

9.3 The NPWS believes that the assessment of the impact of the proposal is inadequate in that it does not consider all of the threatened species likely to be affected by the proposal, nor does it consider all of the impacts that may arise from activities described in the EIS.

9.4 The EIS is viewed as inadequate with regard to NPWS statutory and legislative requirements for the assessment of cultural heritage and Aboriginal consultation regarding Aboriginal site management. NPWS request that the proponent consider the need for further research, with a view to adding further to the knowledge of the Aboriginal cultural heritage significance for the area.

## 10 QLD Queensland Department of Environment (12.8.97)

10.1 Support the implementation of the project in accordance with the Deed of Agreement.

## 11 QLD Tweed Coast Surfrider Foundation (11.8.97)

11.1 The central role of Duranbah Beach in the region is the regularity or consistency of quality surf in the area making Tweed/Coolangatta well placed to capitalise on the travel/tourist attraction of this concentration of world class surf breaks.

11.2 It is the firm belief of contributors to this submission that there are no factors to prevent a duplication of the efficiency and success of the system created at South Stradbroke by the Gold Coast Seaway Bypass System.

11.3 Central concerns are with end result of stage 2 (the bypass system chosen and its management) as well as with the completion of stage 1.

11.4 Placement of remaining sand from Stage 1

- The remaining quantities of sand to be removed from the river entrance as the completion of Stage 1 should not be placed in the inner and outer nearshore zones as these areas have not behaved as predicted by the consultant's own admission in the EIS.

- Previous consultation with Kinhill Engineers revealed the erroneous assumption that the impact of dredging to date was beneficial to surf when in fact Kirra Point has suffered a near total loss of surf in the last 12 months. Thus, all remaining sand should be placed as close as possible to the shoreline in the Point Danger to Frog's Beach area (preferred option) or on the Beach at Kirra west of Kirra groyne or in the Miles Street groyne area.

11.5 Duranbah Sand Discharge Strategy and the Socioeconomic Implications.

- A primary concern is to retain the intergenerational equity accrued and dependent on the consistency of the surf at Duranbah and the appropriate valuation of this factor in the pricing of this environmental resource.

- Apparent in the EIS and through public statements from the consultants that the general overview of the consultant to the beach amenity, surf quality and surf consistency at Duranbah does not satisfy the requirements of the Director of the Department of Planning (NSW).

- No specific mention in the business section of the potential benefits to business of the surf industry or community in NSW.

- No beach amenity survey undertaken for Duranbah

- Inappropriate and unacceptable that in the EIS summary (xxii) the only reference to the surfing industry and community is that there will be "altered beach and wave condition" there. Seems counter to statutory requirements of the EPA Act in relation to "The Principles of Ecologically Sustainable Development" (Point 8 (A), (B) &(D)).

- This contradicts another statement in the EIS (Section 1.5 of Intro) which states the aims of "encouraging the development of other local business and the tourist industry." At least 9 surf shops in the area as well as factories rely on the consistency and world class quality of Duranbah's surf.

- The "Need for Action" further states that the TRESBP "would assist in improving surfing in an area internationally recognised for the high quality of surf" and " improvement of the beach amenity and conditions" and " encourage future growth of the local tourist industry". Therefore, the consistency and quality of the surf at Duranbah are an inseparable and essential component of this equation.

- Another focus of the "Need for Action" section is that the local economy will benefit by "increased employment, financial and social benefits for the community as a whole". However in the conclusion section it is only the Real Estate, Boating and Fishing Industries who will benefit. The surfing community/industry believes that they should be given a high priority due to high unemployment in the region, especially among youth. Therefore any loss of frequency or quality of the surf at Duranbah is not an acceptable trade off as referred to by the Kinhill spokesman.

- Public statements by the Kinhill spokesperson that "Navigational safety would be prioritised over recreational interests" demonstrates a biased outlook or a hidden agenda.

- Bypassed sand should equally benefit NSW, particularly in light of the funding arrangements. Low percentage of bypassed sand to Duranbah may be inadequate.

- The surfing community/industry should not be expected to and will not accept any loss of significance while other community interest groups/industries reap most of the benefits.

11.6 Priority Position of Discharge Outlets

- Key to success is flexibility of position and number of discharge outlets with a minimum of three permanent fixed outlets with the first one 3/4 of the way seaward along the northern river training wall, the second and primary outlet at the southern end of Frogs Beach and the third fixed outlet off the end of the Kirra Point groyne or possibly seaward of the end of this groyne.

- Proposed ratio of percentages of total bypassed sand may present long term management problems as conditions change.

11.7 Choice of Systems

- Unanimous community/industry preference for the fixed jetty system option for various reasons as listed in submission.

## 12 NSW NSW DLWC North Coast Region (11.8.97)

12.1 The TRESBP has the potential to impede or perhaps prevent the natural ingress and rebuilding of the Kerosene Inlet Shoal if it were flooded.

- The EIS says that the Kerosene Inlet Shoals need to be managed by the river management plan however the river management plan has made a decision that no dredging occur downstream of Terranora Inlet. It is therefore appropriate that the entrance management system be responsible for maintaining the shoals.

12.2 Occupation of Crown Land by the system and infrastructure will need to be authorised by way of a lease under the Crown Land's Act, 1989, if ownership is to be held by way of a person other than the Minister for Land and Water Conservation.

12.3 Pooningbah Aboriginal Community Corporation have no objections to the proposal proceeding on the basis that Letitia Road is upgraded and in particular that it is filled to a level fronting Lots 2-8 so that it acts as a levee. Confirmation should be obtained prior to any works commencing.

## 13 QLD Queensland Tourist and Travel Corporation (11.8.97)

13.1 Sand bypassing system should have positive impacts on regional tourism. It is a vital part of the Gold Coast economy.

13.2 Beach erosion, the safety of the Tweed River Bar and water quality within the River are of concern to the tourism industry.

13.3 The QTTC supports the establishment of a sand bypassing system however, the technology chosen and the system operation should be designed to minimise impacts on the environment, local people and visitors.

## 14 QLD Tweed Shire Council (11.8.97)

14.1 Tweed Council would like to clarify who will be responsible for preparing the strategy for lower Tweed estuary sand shoals (Section 4.4.2.4). Tweed Council recommends that "the Sand Bypass Project" should be responsible for preparing the strategy as the system is expected to impact on the estuary.

14.2 Request that re-establishment of shoals through nourishment in the event of a major flood should be included in the long term management strategy of the sand bypass system.

14.3 Tweed Council would like to see a performance and needs based sand supply to Duranbah Beach so as to maintain good surf conditions due to the potential negative impact on this beach (Sections 7.2.3.2, 7.6.4 and 8.3.5)

14.4 The implementation Strategy of the system needs to be flexible and based on a performance needs basis rather than a prescriptive volume of sand.

14.5 The monitoring programme outlined in Section 8.5 is essential and should include a "reaction strategy."

14.6 Should an enclosure be created as a bird roosting site, monitoring of site usage by bird species should also be added to the monitoring programme.

## 15 QLD Queensland Department of Mines and Energy (11.8.97)

15.1 In Section 7.6 there is no mention of the heavy mineral sand industry and/or the possibility of mining any sand material which needs to be discounted.

15.2 The possibility of separating construction sand or gravel from the extracted material should also be discussed with regard to commercial opportunities.

## 16 QLD Queensland Transport - Marine Operations (11.8.97)

16.1 The Regional Manager of Marine Operations is required to be advised regarding the details of any proposed dredging activities associated with the project.

## 17 NSW [redacted] (7.8.97)

17.1 Mr Chenhall has been a visitor to Tweed Heads for 35 years and states that he has never seen so much sand build up on some of the beaches as at present. He therefore questions the shortage of sand.

17.2 Curved breakwater alternative suggested.

## 18 QLD Queensland Department of Environment (18.8.97)

18.1 Support the project subject to effective environmental controls being implemented.

18.2 IAS is generally comprehensive however a detailed EMP will need to be developed once a system has been selected. The Department would be pleased to review the EMP when a preferred system is selected

18.3 Section 8 provides the framework for the EMP which particularly needs to include:

- a comprehensive Lower Estuary Marine Shoals Management Strategy;
- management measures for the mitigation of impacts to shorebirds/waterbird species roosting in the vicinity of the Tweed estuary entrance;
- noise mitigation measures for both construction and operational phases;
- measures to manage any new impacts resulting from recovery and pumping methods used; and
- contingency measures in case the system should prove unsuccessful.

18.4 There are no cultural heritage concerns however, a cultural heritage assessment is required for parts of the proposal which involve demolition, surface disturbance, excavation, trenching, cuttings or any other earth works or construction. The Developer should contact the Regional Manager if any discoveries of heritage significance are made.

18.5 Monitoring of Duranbah Beach is supported.

18.6 Exclusion zone of 50m around Kirra Reef should be defined.

18.7 Effects of tidal changes on wetlands should be incorporated in the Recommended Lower Estuary Marine Shoals Management Strategy (Section 4.4.2.4)

18.8 Sediment quality of lower estuarine shoals should also be addressed in the Lower Estuary Marine Shoals Management Strategy.

## 19 QLD Queensland Department of Families, Youth and Community Affairs (8.8.97)

19.1 Site Details.

- In connection with the issue of Native Title claims, the unavailability of accurate maps is noted, for the sake of clarity however, it is recommended that those maps be provided, perhaps in the proposed EMP, along with tenure history material.

- If discussions have occurred with the relevant Aboriginal groups regarding native title issues, this fact should be documented in the EIS. Otherwise, it is recommended that discussions be instigated with those groups on the possible need for a mutual accommodation of interests on the project site.

19.2 Description of Environment - Archaeological and Heritage Values

- It is recommended that discussions occur with Queensland Aboriginal groups with affiliation to the study area, with professional assistance if necessary, over the site's possible cultural heritage significance.

19.3 Impacts.

- The possibility that native title exists over lands within the study area should be more thoroughly investigated.

- Evidence is required of a genuine attempt by the proponents to comply with the provisions and intent of the *Native Title Act 1993*. A standard letter to FAIRA inviting comments is not likely to be considered a sufficient attempt to deal with native title rights.

- The recommendation given in Section 8.3.8 that the area is "unlikely to contain Aboriginal sites" is ambiguous considering the earlier description of potential heritage values being sufficiently uncertain as to warrant further investigation.

- It is recommended that an archaeological survey be undertaken over the area in consultation with the relevant local Aboriginal group(s).

19.4 Social Impacts

- The submission lists impacts on property owners and proposed development, the commercial and recreational fishing industry, use of the site by the public, and visual and aesthetic impacts.

19.5 Consultation

- It is noted that the consultation process has been ongoing with specific matters addressed as required with the exception of the relevant indigenous groups as discussed above.

- It is considered that social and visual impacts have been addressed and adequately assessed.

- The possible negative impacts concerning the Land Based System and the Jerry Mounted System have been recognised and will need to be considered in the decision-making process.

## 20 ACT Australian Heritage Commission (18.8.97)

20.1 Concerns primarily relate to the nearby Ukerebagh Nature Reserve for reasons explained (copy of the Commission's place report attached to submission).

20.2 Agree with the assessment that a Species Impact Statement for the little tern is required before the proposal proceeds further due to the possible adverse effects on this species.

20.3 State Planning and Approval Processes (Section 2)

- Appears to be no discussion of Commonwealth legislation, approvals or processes. Recommended to include in this section if title amended.

- Recommended to include outlines of relevant Commonwealth legislation, together with its major provisions, requirements and statutory obligations.

- If any Commonwealth actions are involved, the proposal will need to be referred to the Commission for further advice under Section 30 of the Act.

- Recommended to also include mention of obligations which fall upon the Commonwealth Government to ensure that provisions of relevant international agreements, such as JAMBA and CAMBA, are upheld.

- Recommended to also include a brief overview of Commonwealth legislation relating to protection of Aboriginal and European historic heritage and its implications.

20.4 The Existing Environment ( Section 4)

- Should mention the fact that Ukerebagh Nature Reserve has been entered in the Register of the National Estate in Section 4.5.3.2.

20.5 The exemption of telecommunications carriers (Section 4.4.1.1.) from the statutory requirements of local and state government bodies expired on 30 June 1997.

20.6 The mitigating measure stated in Section 8.3.11 for minimising impacts on shorebirds is seen as an unsatisfactory mitigating measure.

20.7 Environment Management (Section 8.3.8)

Recommend that consultation with the Aboriginal Lands Council (Section 8.3.8) be given high priority regarding cultural heritage places within the project area.

## 21 NSW NSW DLWC Head Office (12.8.97)

21.1 The development of a system which ensures a permanent opening to the Tweed River is an excellent initiative for the safety of boat users, the ecology of the estuary and the local community.

21.2 Improved water quality may also lead to greater tourism so it may be beneficial to instigate a water quality monitoring programme in conjunction with the local Estuary Management Committee.

21.3 Note that deepening the entrances to estuaries makes them more accessible to pelagic fish species including sharks which could result in negative publicity for the area so this aspect should also be monitored.

21.4 The selected option should have the least negative impact on bird populations and the monitoring programme should include the effectiveness of any management practices designed to improve habitat for shorebirds.

21.5 Monitoring of fish and prawn larvae entering the estuary should also be considered as well as monitoring of any changes to ichthyoplankton and crustaceans.

21.6 Wetland monitoring should not be by aerial photographs alone. Saltmarsh communities should be monitored.

21.7 A strategy should be devised to address management response options for environmental impacts indicated by monitoring.

21.8 Ongoing monitoring of the impact of bypassing operations on coastal processes is considered an important aspect of sound project management.

21.9 Prior to consent being granted for the proposal, the concurrence of the Minister for Land and Water Conservation is required.

21.10 Floodplain Management Aspects. In social and planning terms the statement given in Section 4.4.1.5 that significant lowering of peak flood levels in the main arm will occur, is misleading as the reductions in flood levels are not significant enough to warrant any changes to planning or development controls that Tweed Shire Council may have in place.

21.11 Minor Ports Aspects. The permanent bypassing system should have a positive financial benefit to the commercial fishing industry.

## 22 NSW NSW Department of Public Works and Services (12.8.97)

22.1 Do not wish to make a submission for this EIS but would welcome an opportunity to examine detailed proposals for the selected sand bypassing system and offer comments at that time.

## 23 NSW NSW Waterways Authority (8.8.97)

23.1 The Authority is satisfied that its concerns have been addressed in a satisfactory manner.

## 24 NSW NSW Heritage Office (12.8.97)

24.1 EIS contains some confusion regarding the Heritage Office and what was the Heritage Branch of the DUAP (Appendix D-5, 1.1.5 & 1.1.8). The Heritage Branch of the DUAP ceased to exist on 1 July 1996.

24.2 Any permit to disturb an historic shipwreck must be obtained from the Director of the Heritage Office.

24.3 While the EIS concludes there are no known shipwrecks (Section 7.6.2), historical documentation suggests otherwise; therefore the actions of any dredging operations are likely to have a severe impact on these.

24.4 A detailed archaeological survey should be conducted prior to the commencement of dredging operations.

24.5 Greater consistency is required between assessment of submerged archaeological sites and terrestrial ones. The EIS should consider more fully the steps to be taken should a shipwreck be disturbed in the form of a detailed strategy which should include access to a prepared Maritime Archaeological Team.

24.6 A GIS Model which predicts where shipwrecks are likely to occur in estuarine areas has been prepared by Dr Bill Boyd at the Centre for Coastal Management, Southern Cross University and should be applied in assessing potential shipwreck sites.

24.7 The EIS states there are "no system specific impacts" from the various potential dredging operations (Page 7-96) which is considered to be clearly not the case. To determine the different impacts from various dredgers, a qualified and experienced Maritime Archaeologist should be sought for advice.

24.8 There is no reference to terrestrial historic archaeological sites and it is unclear whether this is because there has been no survey or whether no sites were located in a survey. If the works are to disturb land areas then an archaeological assessment should be undertaken and an excavation permit must be obtained from the Heritage Council for any proposed disturbance to archaeological relics or a site known or suspected to contain relics protected by the Heritage Council.

**25 NSW NSW Fisheries (18.8.97)**

25.1 No concerns, however would like any impacts whether predicted or not to be reported to NSW Fisheries during monitoring.

**26 QLD Queensland Police Service (12.8.97)**

26.1 EIS very comprehensive, with no issues which could be addressed by the Queensland Police Service.

**27 QLD Kirra Surf (25.8.97)**

27.1 Outlet needed at Duranbah Beach.

**28 QLD [redacted] (7.8.97)**

28.1 Concerned that the proposal will adversely affect surf quality at Duranbah Beach and possibly others. Therefore opposed to the proposal.

**29 QLD Australian Marine Conservation Society (28.8.97)**

29.1 Expressed concern regarding erosion at Letitia Spit such as:

- loss of visual and recreational amenity,
- the possibility of logs being released by erosion constitutes a recreational and minor shipping hazard.

29.2 Concerned over doubling of maximum wave height into the river and the adequacy of the analysis of the inferred process response.

29.3 Recolonisation of dredged areas unsubstantiated.

29.4 Uncertainties of the relative ecological merits of the fixed versus jack-up dredging systems.

29.5 Opportunity should be taken through this project to enhance wildlife habitats, especially for avifauna.

29.6 The project is supported, using best environmental management practices.

# *APPENDIX C*

*ADDITIONAL FLORA AND FAUNA INFORMATION*

Rec'd Alan Dyson 0
20.2.98.



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# FACSIMILE TRANSMISSION

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| **TO:** | Kinhill | | |
| **ATTN:** | Dr Tom Connor | **DATE:** | 19 February 1998 |
| **FAX NO:** | 33689229 | **PROJECT NO:** | 10973 |
| **FROM:** | Dr. Rick Morton | **PAGES:** | 3 (including header) |

Dear Tom

**TWEED RIVER ENTRANCE SAND BYPASSING PROJECT-AVIFAUNA ISSUES**

In reference to the review from NSW DUAP on the threatened Avifauna Assessment for the above project please find attached the following comments;

*(i) the importance of south Head Beach as a bird habitat*

We are surprised by this comment as the report places emphasis on clearly describing this aspect. Our statements are supported by detailed bird survey work, some of which was conducted specifically for this project (ie the 12 month bird monitoring study conducted by WBM).

We would appreciate clarification of some of the comments in the DUAP response as we are unsure of their justification and scientific basis. For example "...it might serve as a chain of habitat areas used by migratory birds, which, if disturbed, could disrupt the birds' migratory patterns to such an extent that the viability of the population is threatened". We would need to clarify such issues with the reviewer directly.

*(ii) the need to extent the assessment to other species of avifauna*

We have considered all potential species that may, or have been, reported to use the area. This list of species to be assessed was agreed in consultation with NPWS. It seems inefficient to examine species highly unlikely to occur in the area. However, should be recognised that the assessment included species such as the beach stone-curlew, great knot and large sand plover all of which have not been recorded for the Tweed estuary (or South Head beach) but have been reported in adjacent areas such as the Richmond Estuary.

*(iii) Clarification of the methodology used to establish bird numbers*

The comment that " It is unclear whether any bird surveys were undertaken as part of this project" is surprising. The data set on avifauna communities in the Tweed area is extensive and one of the better datasets of its type in NSW. A series of surveys have been conducted over the past 10 years by a wide



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variety of organisations. A specific survey over a 12 month period was conducted for the bypassing project. Details of that program are clearly incorporated into the 8 part tests and referenced in the Reference section of the report.

NPWS are aware of these surveys and have not expressed concern with the methodologies adopted. The reports, which are all clearly referenced, provide details of their respective methodologies should DUAP wish to review these.

*8 part test for waders on South Head Beach*

It is hard to find a justification for doing separate tests for each species.

The comment that it would be "easy to overlook factors that may be specifically important for one species when a number of species are considered together" is not considered appropriate. The assessments were conducted by persons with extensive recent knowledge of the Tweed area and were confirmed by NPWS officers. No additional factors are likely to be relevant. Undertaking separate tests would be time consuming and of little value.

For example, undertaking a specific test for the beach stone-curlew is unlikely to provide any additional information given that this species has not been recorded from the Tweed area.

The comment that our interpretation of the term "threatening process" is incorrect is difficult to respond to. We recognise that threatening processes have not been defined as yet with respect to the TSC Act and that this proposal is not a "threatening process" as defined under the Act. Initially we adopted the suggested DUAP approach. However, NPWS advised that although legal definitions were not available for threatening processes as yet, we should use our scientific experience to address this issue in keeping with the intent of the Act. Consequently, we revised the report and adopted the approach requested by NPWS. This comment applies to this issue as raised by DUAP for other species.

The comment that "this might imply that all populations, no matter how small are important" is incorrect.

It was determined that waders do not breed on South Head Beach on the basis of the relevant (and well accepted) references listed in the report. This assessment was supported by NPWS officers with knowledge of the area.

*Review of 8 part test for the Osprey*

The Osprey is well known to live and breed in close proximity to humans. A large number of individuals live outside conservation reserves. Information on Ospreys in the Tweed area is extensive and reliable. As noted in the report, the Osprey is only occasionally observed near South Head Beach and does not breed there and would rarely use the area for feeding as suitable habitat is not present. It is very difficult to identify any impacts from the bypassing project to this species.

*Review of 8 part test for Little Tern*

The approach to the Little Tern issue was developed after extensive consultation with NPWS, particularly John Martindale. We concur with that approach.

*Other flora and fauna issues*

As for the Little Tern issue, the list of species to be assessed was developed after extensive consultation with NPWS and took into account NPWS data. Those species considered in the 8 part tests were those

regarded by NPWS as known to, or likely to, occur in the region and potentially influenced (even remotely) by the project.

I trust this is useful. Many of the comments appear to be minor and may reflect a lack of understanding of the process we went through with NPWS. Perhaps direct discussions with the reviewers would be beneficial to clarify the issues addressed and confirm the appropriateness of the mitigating options (if required) identified.

Regards

R. M. Morton

Rick Morton

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# FACSIMILE TRANSMISSION

FAXED

| | | | |
|---|---|---|---|
| TO: | DUAP | | |
| ATTN: | Stuart Little | DATE: | 9 March 1998 |
| FAX NO: | (02) 9391 2194 | PROJECT NO: | 10973 |
| FROM: | Dr Rick Morton | PAGES: | 5 (including header) |

Dear Stuart

**TWEED ENTRANCE BYPASS - THREATENED SPECIES ASSESSMENT**

Following on from our telephone conversation of 3 March, I consider it useful to provide you with some background on the 8-part test process adopted for the above project, to address the concerns raised in your minute to Don Geering.

The information set out below is provided in response to your suggestion to prepare a table for all threatened species in the Tweed region indicating their habitat needs, survey information, techniques used, nesting habitat, proximity to study area etc, which would be extremely time consuming, and would contribute little to the impact assessment for the project.

It is apparent that the most refined NPWS database information is of such a broadscale nature that it would include 37 bird, 7 amphibian, 31 mammal and 7 reptile species. This large number of species occurs in the listing because the database information includes a wide range of habitats that, while present in the broader Tweed region, are not in the vicinity of or relevant to this project (eg. hinterland and rainforest areas). More refined data, specific to particular habitats, is not available.

The process the consultants have adopted in relation to impact assessment for Threatened Species was developed in conjunction with NPWS. It involved a staged approach directed at applying 8-part tests to all threatened species associated with potentially affected habitats

The process involved :

(i) Identifying habitats potentially affected by various impact processes.
(ii) Determining which threatened species known from the region are likely to utilise those affected habitats
(iii) Assessing effects to those species through the 8-part tests and determining the need for any SIS's taking into account any opportunities to mitigate potential adverse effects identified in the 8-part tests.
(iv) Finalising the SIS assessment.

In essence, this agreed and adopted approach to defining which species need to be subject to 8-part tests is the converse of the approach suggested in your minute. For the bypass project it involves assessing which habitats could be affected, followed by a review to identify which threatened species (by examining the NPWS database in conjunction with NPWS experts) could be influenced by the changes, rather than assessing the range of threatened species known from the broader region, determining the habitat

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requirements of each and then assessing whether their habitats would be affected by the project. Both approaches are equally valid although the former is more efficient.

Our work for this project has involved detailed studies, considerable liaison and checking with experts familiar with the region.

I have provided a brief description of each of the steps undertaken for the bypass threatened species assessment below.

(i) Identification of Impact Processes

The impact processes are described in detail in the EIS prepared for the project and are summarised in the Threatened Avifauna Assessment Report (pages 5 to 8). In brief, the proposed Tweed River Entrance Sand By-passing will only affect habitats at South Head Beach and the mouth of the Tweed River (see attached map). This conclusion was reached because the proposed sand by-passing may potentially involve:

- changes to the morphology of South Head Beach (beach retreat);
- negligible tidal range changes within the river mouth; and
- construction and operational effects at South Head Beach (ie. placement and operation of infrastructure).

*Changes to Beach Morphology*

The change in morphology to South Head Beach (ie. beach retreat) may occur as a result of some (but not all) proposed options for sand by-passing. None of the options would involve a general alignment retreat of greater than 90 metres. In addition, any such foreshore retreat would occur gradually over a prolonged period (2-5 years) until the beach profile reaches equilibrium. This would involve similar beach fluctuation processes to those that presently occur as a result of major storms and associated wave action, the principal difference is that each phase of erosion would extend somewhat further landward and, foreshore accretion would not occur to the same degree as presently occurs until the new equilibrium is reached. Nevertheless, species known or likely to feed or roost on South Head Beach may be affected in some way by this change for several years until the new equilibrium is reached.

*Infrastructure Effects*

The construction and operation of some infrastructure at South Head Beach (proposed under some by-passing options) may also affect some species associated with the beach, foreshore and near shore coastal waters. Disturbances may relate to placement of infrastructure, lighting, vehicle movement and, most importantly, increased recreational use of the beach. The area of influence would be in close proximity to the infrastructure with most recreational usage occurring between the existing breakwater and infrastructure (eg. anglers, walkers).

*Tidal Range Effects within the Estuary*

Tidal range changes resulting from the development will be negligible within the Tweed Estuary. For instance, predicted long-term changes in tidal ranges throughout the estuary as a result of the bypassing project in isolation, would involve Mean High Water Spring tide levels increasing by 0.01m and Mean Low Water Spring tide levels decreasing by 0.02m (see Table 2.1, page 6 of Threatened Avifauna Assessment Report)

Even when all approved dredging works in the estuary have been completed (a number of dredging operations have been approved within the estuary and are detailed in the sand bypassing EIS), Mean High Water Spring Tide levels are anticipated to increase by less than 3cm and Mean Low Water Spring levels will decrease by less than 2cm (see Table 2.2, page 7 of Threatened Avifauna Assessment Report).

In terms of recognised bird roosting or feeding areas (that is, Terranora Broadwater, Cobaki Broadwater and Shallow Bay-Tony's Bar), changes in such areas would be imperceptible, involving a 1cm increase in the high water levels and 1cm decrease in low water levels. Such variations would only occur in spring tides

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and would be much less at other tidal phases (eg. neap tides). Such variations would not reduce the area of specific roosting sites (as a result of higher tide levels) or result in an increase in feeding areas (as a result of the increase in the intertidal area available). Furthermore, the magnitude of such changes is within the range of natural variation.

Aquatic and riparian habitats within the Tweed Estuary will therefore not be affected. These habitats can thereby be eliminated from any 8 part test that examines the effects on threatened species (Simon Nelly - Northern Zone NPWS Office, personal communication).

In summary, there will be no effects as a result of the proposed sand-bypassing project to habitats of the Lower Tweed Estuary. All impacts relate to habitats at the mouth of the Tweed River and on South Head Beach

(ii) **Determining Potentially Affected Threatened Species**

The habitats at the mouth of the Tweed River and on South Head Beach include intertidal sandflats and exposed coastal beach.

A review of the NPWS databases in conjunction with NPWS Threatened Species assessment officers (contact Simon Nelly - Northern Zone NPWS Office) and scientific experts (Dr John Martindale, NPWS) indicated that the only threatened species present, or likely to be present, on intertidal sand and mudflats and exposed coastal beach habitats within the Tweed River mouth and on South Head Beach were all bird species and included :

- two species of resident waders (Sooty and Pied Oystercatcher);
- seven species of migratory waders (Beach Stone-curlew, Lesser Sand (Mongolian) Plover, Greater (Large) Sand Plover, Black-tailed Godwit, Terek Sandpiper, Sanderling and Great Knot);
- Little Tern;
- Black-necked Stork; and
- Osprey.

This process ensured that 8-part tests would only be conducted on threatened species of relevance to the bypassing project rather than for each of the 37 bird, 7 amphibian, 31 mammal and 7 reptile species that are known to occur from the full range of habitats (eg. including hinterland and rainforest) in the broader Tweed region, most of which are extremely remote from any affected areas.

It should be noted that some of the threatened bird species identified by NPWS as needing to be assessed, since they may have some potential to occur on South Head Beach/the river mouth region (eg. Black-necked Stork), have not been previously recorded from Tweed but from coastal areas to the south (eg. Ballina) Thus, a conservative approach was adopted.

(iii) **Completion of 8-part Tests and Determination of the Need for SIS**

Eight-part tests were undertaken in accordance with recommended procedures. Draft tests were prepared and submitted to NPWS. Additionally, several meetings were held with NPWS staff expert in threatened avifauna and a review was undertaken of data resulting from the 12 month bird monitoring program initiated specifically for the bypass project (WBM Oceanics Australia, 1996). Furthermore, all reports relevant to such species (eg. Recovery Plan for Little Tern) were reviewed and potential impact processes confirmed.

The approach to undertaking the 8-part tests (in conjunction with NPWS staff) incorporated a "loop" process whereby potential impact mechanisms were identified and modifications to the project considered. Initially, an 8-part test was undertaken and potential impacts identified. A modified proposal was then determined. The capacity of the modified proposal to avoid adverse impacts was assessed by undertaking the 8-part test again. If it was considered by NPWS experts that the threatened species would not be impacted, then no further tests were undertaken.

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However, if the NPWS experts thought that the impacts may still be significant, then a further proposal was sought. This process of evaluating variations of the proposal and consequent impacts continued until the NPWS bird experts agreed that an impact to the particular threatened species would not occur.

A consequence of this approach was that certain constraints were placed upon various bypass options. These constraints are detailed in the Threatened Avifauna Assessment Report.

For example, extensive studies on birds of this area (see Martindale 1987 and WBM 1996) have demonstrated that, although Little Tern roost sites varied considerably along South Head Beach, the area between the breakwater and 1000m along the beach did not constitute a major or viable long term roosting site for Little Terns. This constraint ensured disturbances resulting from Category 3 Options would be restricted to the area that was not a long term viable roost site for Little Terns (a more detailed description of this aspect is provided on page 31 and 32 of the Threatened Avifauna Assessment Report).

**(v) Finalising the SIS Assessment**

The results of the above 8-part tests and determination of mitigating options indicated that appropriate constraints could be placed upon bypassing systems to ensure the bypass project would not adversely affect any threatened species. Hence, NPWS experts indicated that in their view there was no need to prepare an SIS, provided the constraints were adopted. During discussions, the project agreed to provide assistance to NPWS which wishes to provide an enhanced roosting area in the area. This was intended as a public relations exercise to show that the bypassing project was prepared to "go the extra mile".

I appreciate the difficulty in assessing the methodology adopted in the WBM Oceanics Australia twelve month bird monitoring study which formed a major data source for the 8-part tests without being able to view the report. It is understood that this report has now been sent to your office by DLWC.

I trust the above meets with your approval and resolves any issues you may have had with the 8-part tests in the WBM Threatened Avifauna Assessment Report.

If you have any queries, or wish to discuss this with me further, please do not hesitate to call.

If any issues still need to be resolved, the next approach may be to meet you on site where the existing habitat, the potential habitat impacts and the potential impact on threatened species can be discussed in relation to on-site features. We believe that project personnel have previously suggested that such an on-site meeting may help resolve issues.

Yours faithfully
**WBM OCEANICS AUSTRALIA**

Dr Rick Morton
Associate
Manager - Ecology and Environmental Management

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WBM OCEANICS AUSTRALIA

# FACSIMILE TRANSMISSION

| | | | |
|---|---|---|---|
| **TO:** | DUAP | | |
| **ATTN:** | Stuart Little | **DATE:** | 30 March 1998 |
| **FAX NO:** | (02) 9391 2194 | **PROJECT NO:** | 10973 |
| **FROM:** | Dr Rick Morton | **PAGES:** | 9 (including header) |

Dear Stuart

**TWEED ENTRANCE BYPASS THREATENED SPECIES ASSESSMENT**

Following on from our recent telephone conversations and your facsimile of 27 February 1998 to Tom Connor (Kinhill Pty Ltd) regarding specific issues on threatened species matters for the above project.

It is my understanding that the key outstanding issue relates to: the likelihood of particular threatened species being present on, or near, the area influenced by the bypassing project site and; being potentially affected by the proposed bypassing operation. Additionally, I note that your concerns regarding the issue of our focussing eight-part tests only on threatened avifauna.

As noted in our facsimile of 9 March 1998 to yourself, the process which we adopted to define those threatened species which needed to be subject to the 8-part test involved assessing which habitats could be affected, followed by a review to identify which threatened species were associated with those habitats and hence subject to possible influence by any resultant changes.

I appreciate that DUAP requires a slightly different approach in which the range of threatened species known from the broader region is to be assessed, the habitat requirements of each species determined, and then an assessment made as to whether they could be affected by the project. In this regard, we have prepared the attached table which addresses species other than those identified in the Representations Report in the manner required.

I have provided a brief description of the methodology we have undertaken for the additional threatened species assessment below.

i) **NSW National Parks and Wildlife Service Database Search**

A search was done of the NSW NPWS database on 18 March 1998. The search requested information on all threatened flora and fauna species to occur within a 10 km radius of the entrance to the Tweed River mouth. This ensured a conservative approach was adopted as it covered terrestrial, coastal and estuarine habitats. However, as noted below, the bypassing operation would not influence terrestrial or estuarine habitats, as any impacts from the project

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would be exclusively associated with the Tweed River entrance and adjacent coastal beaches. The list of species resulting from the database search is provided below.

**List of Threatened Species from NSW NPWS Database that occur with 10km of Tweed River Entrance (* = 8-part test undertaken in Representations Report)**

## Fauna

| Scientific Name | Common Name |
|---|---|
| *Crinia tinnula* | Wallum Froglet |
| *Chelonia mydas* | Green Turtle |
| *Puffinus carneipes* | Flesh-footed Shearwater |
| *Ixobrychus flavicollis* | Black Bittern |
| *Ephippiorhynchus asiaticus** | Black-necked Stork |
| *Lophoictinis isura* | Square-tailed Kite |
| *Pandion haliaetus** | Osprey |
| *Amaurornis olivaceus* | Bush-hen |
| *Calidris tenuirostris** | Great Knot |
| *Limosa limosa** | Black-tailed Godwit |
| *Xenus cinereus** | Terek Sandpiper |
| *Haematopus fuliginosus** | Sooty Oystercatcher |
| *Haematopus longirostris** | Pied Oystercatcher |
| *Charadrius leschenaultii** | Greater Sand Plover |
| *Charadrius mongolus** | Lesser Sand Plover |
| *Sterna albifrons** | Little Tern |
| *Ptilinopus regina* | Rose-crowned Fruit-Dove |
| *Tyto novaehollandiae* | Masked Owl |
| *Podargus ocellatus* | Marbled Frogmouth |
| *Todiramphus chloris* | Collared Kingfisher |
| *Lichenostomus fasciogularis* | Mangrove Honeyeater |
| *Monarcha leucotis* | White-eared Monarch |
| *Coracina lineata* | Barred Cuckoo-shrike |
| *Phascolarctos cinereus* | Koala |
| *Potorous tridactylus* | Long-nosed Potoroo |
| *Pteropus alecto* | Black Flying-fox |
| *Syconycteris australis* | Queensland Blossom Bat |
| *Mormopterus beccarii* | Beccari's Mastiff-bat |
| *Miniopterus australis* | Little Bent-wing Bat |
| *Nyctophilus bifax* | Eastern Long-eared Bat |
| *Sousa chinensis* | Indo-Pacific Humpbacked Dolphin |

## Flora

| Scientific Name | Common Name |
|---|---|
| Lauracea | *Cryptocarya foetida* |
| Myrtaceae | *Syzygium moorei* |
| Rubiaceae | *Randia moorei* |
| Rutaceae | *Acronychia littoralis* |

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ii) **Assessment of Impacts to Threatened Species**

As can be noted from the above list, the 8-part tests which have been undertaken to date relate to those species which occur on the coastal beaches and near the Tweed River entrance. These species (all avifauna) were selected on the basis of impact assessments and advice and discussions with National Parks and Wildlife Service Officers.

However, there are 25 species in the above list which have not been subject to 8-part tests because they were considered by National Parks and Wildlife Service Officers to either not occur in the potential impact area, or, if present, were highly unlikely to be impacted by the bypassing operation. The basis for this assessment is detailed in the table attached.

iii) **Assessment of Impacts to Threatened Species Not Previously Assessed**

Attachment 1 indicates, for each threatened species not previously assessed, the habitat requirements of each species (based on available scientific literature), the likelihood that the species that occur within the study area (defined as 10 km from the entrance to the Tweed River) and the potential that the species, should it occur, will be impacted by the bypassing operation.

The assessment of potential impacts of the project on each species was based upon the anticipated impact processes associated with bypassing. As noted in my facsimile to you of 9 March 1998, and in much greater detail within the EIS, impact processes are likely to involve :

- changes to the morphology of South Head Beach (beach retreat affecting the open coastal surf beach);
- construction/operation affects at South Head Beach (ie. placement and operation of infrastructure); and
- negligible tidal change ranges within the river mouth (ie. no impacts to estuarine areas).

It should be noted that the 10 km database search that has been undertaken includes the estuarine areas for which no impacts are anticipated. Therefore, species utilising the Tweed estuary would not be affected. In this regard the list of species assessed is highly conservative.

iv) **Conclusion**

As noted from Attachment 1, none of the species listed in the National Parks and Wildlife Services database, which have not been subject to 8-part tests undertaken to date for the bypassing project, are likely to be impacted. Any potential impact on these species is considered to be extremely unlikely.

I trust that this additional information satisfies DUAP's requirements and that this issue can be progressed to finalisation. Please do not hesitate to contact me with any queries in this matter.

Yours faithfully
**WBM OCEANICS AUSTRALIA**

for Dr Rick Morton
Associate
Manager - Ecology and Environmental Management

# ATTACHMENT 1

## Endangered or Vulnerable Species (excluding those for which 8-part tests have previously been undertaken) Recorded within 10 km of the Bypassing Operation.

### Fauna Area List

| Scientific Name | Common Name | Habitat Requirements | Likelihood of occurrence in study area | Possible effects from bypassing |
|---|---|---|---|---|
| *Crinia tinnula* | Wallum Froglet | An 'acid frog' restricted to acidic waters in coastal lowlands (Czechura 1995). It is found in paperbark (*Melaleuca*) swamps in wallum areas of poor drainage (Cogger 1994; Barker *et al.* 1995). | • very low likelihood<br>• absence of suitable habitat | none |
| *Chelonia mydas* | Green Turtle | Inhabits shallow coastal waters and reef habitats, feeding on seagrass and algae (Limpus 1995) | • low likelihood<br>• no reefs in study area | negligible |
| *Puffinus carneipes* | Flesh-footed Shearwater | A pelagic species which, whilst occasionally observed inshore, is generally located over continental shelves and slopes (Marchant and Higgins 1990). Breeding is in colonies on oceanic islands (Harrison 1987) | • low likelihood<br>• oceanic species, may be casual or accidental visitor | none |
| *Ixobrychus flavicollis* | Black Bittern | Although found in a variety of habitats such as rank grassland, woodland, and rainforest, this species is generally associated with wetlands and estuarine and littoral habitats, especially with tree-lined rather than reed-lined edges (Hancock *et al.* 1984; Marchant and Higgins 1990). | • medium likelihood of occurring in estuarine area<br>• very low likelihood of occurring on ocean beaches | negligible |
| *Lophoictinia isura* | Square-tailed Kite | This specialised predator of the canopy forages in open forests, woodlands and mallee, with occasional forays into heathland. Hunting occurs in areas rich in passerines (Garnett 1993). This may include the edges of suburbia, especially of older, 'green' suburbs (Czechura 1995). | • very low likelihood<br>• limited suitable habitat | negligible |

| Scientific Name | Common Name | Habitat Requirements | Likelihood of occurrence in study area | Possible effects from bypassing |
|---|---|---|---|---|
| *Amaurornis olivaceus* | Bush-hen | Occurs in wet areas, generally with long grass or reeds, ranging from the fringes of rainforests to swamps, creeks, flooded areas and even gardens with heavy vegetation (Pizzey and Doyle 1980; McDonald 1988). | • medium likelihood within study area<br>• very low likelihood of occurring on ocean beaches | negligible |
| *Ptilinopus regina* | Rose-crowned Fruit-Dove | Habitats include rainforest, wet sclerophyll forest, vine-thickets, *Melaleuca* woodlands and mangroves (Higgins and Davies 1996). In the southern parts of its range, such as northern New South Wales, this species is more restricted to rainforest (Recher *et al.* 1995), possibly due to sharper separation of forest types due to factors such as soil type and microclimates, and due to fragmentation of habitats by agriculture (Frith 1982). | • very low likelihood<br>• limited suitable habitat | none |
| *Tyto novaehollandiae* | Masked Owl | Occurs both within forests, including plantations of exotic species such as *Pinus ellioti*, and on forest margins. Requires tree hollows for nesting, usually within tall forest (Garnett 1993). | • very low likelihood<br>• very limited suitable habitat | none |
| *Podargus ocellatus* | Marbled Frogmouth | Inhabits closed forest such as notophyll vine forest (Ingram 1991), particularly when emergent species such as *Eucalyptus grandis* and *Lophostemon confertus* are present. The palm *Archonopterix cunninghamiana* is also often present (Garnett 1993). | • very low likelihood<br>• no suitable habitat | none |
| *Todiramphus chloris* | Collared Kingfisher | Occurs predominantly in mangroves (Ford 1982), although it may also be present in adjacent gardens and beachfront vegetation (Fry *et al.* 1992) | • medium likelihood due to presence of mangroves within estuary | negligible |
| *Lichenostomus fasciogularis* | Mangrove Honeyeater | Although virtually confined to mangroves (Ford 1982), this species may also occur in gardens and other adjacent vegetation (Simpson and Day 1996; Noyce 1997). | • medium likelihood due to presence of mangroves within estuary | negligible |
| *Monarcha leucotis* | White-eared Monarch | This species is associated with wet forests (McDonald 1988), especially lowland rainforest (Noyce 1997), and may also be found in mangroves (Boles 1988). | • low likelihood<br>• insufficient preferred habitat, mangroves a secondary habitat | negligible |

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| Scientific Name | Common Name | Habitat Requirements | Likelihood of occurrence in study area | Possible effects from bypassing |
|---|---|---|---|---|
| *Coracina lineata* | Barred Cuckoo-shrike | Typically associated with rainforest (McDonald 1988), this species may forage in more open forest (Simpson and Day 1996) and occasionally in isolated fruiting trees (Noyce 1997). | • low likelihood<br>• insufficient suitable habitat | negligible |
| *Phascolarctos cinereus* | Koala | Koalas are characteristic of eucalypt forest (Martin and Handasyde 1995), favouring *Eucalyptus tereticornis* and *E. Camaldulensis* in the northern parts of their range but also feeding on tea-tree (*Leptospermum laevigatum*) and paperbark (*Melaleuca ericifolio*) (Lee and Martin 1988). | • low likelihood<br>• insufficient suitable habitat | negligible |
| *Potorous tridactylus* | Long-nosed Potoroo | Potoroos are found in habitats with relatively thick ground cover, such as coastal heath and dry and wet sclerophyll forests. Adequate cover is a major requirement (Johnston 1995). | • very low likelihood<br>• lack of suitable habitat | negligible |
| *Pteropus alecto* | Black Flying-fox | Often found in mangrove and paperbark swamps (Hall 1995) but also inhabits tall forests and woodlands (Eby 1995) | • high likelihood<br>• may forage throughout the Tweed region<br>• may travel up to 50 kilometres from their camp in search of blossoms and fruit (Hall 1995) | negligible |
| *Syconycteris australis* | Queensland Blossom Bat | Inhabits heathlands and *Melaleuca* swamps (Hall and Martin 1995) and visits rainforest and coastal eucalypt forest when blossom is not available in preferred habitats. In New South Wales, coastal rainforest is an especially important habitat, particularly when adjacent to heathlands (Law and Spencer 1995). | • high likelihood<br>• may forage throughout the Tweed region | negligible |
| *Mormopterus beccarii* | Beccari's Mastiff-bat (Freetail-bat) | This species is found throughout a broad range of habitats from desert to rainforest, paperbark and pandanus (McKenzie 1995) and in coastal forests and cleared land (Hall and Martin 1995). | • low to medium likelihood<br>• may be casual forager in the Tweed region | negligible |

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| Scientific Name | Common Name | Habitat Requirements | Likelihood of occurrence in study area | Possible effects from bypassing |
|---|---|---|---|---|
| *Miniopterus australis* | Little Bent-wing Bat | Feeds beneath the canopy of rainforests, *Melaleuca* swamps and dry sclerophyll forests. It roosts in caves and tunnels and is largely coastal in New South Wales (Dwyer 1995). | • medium likelihood<br>• may be casual forager in the Tweed region | negligible |
| *Nyctophilus bifax* | Eastern Long-eared Bat | Found in habitats from rainforest to riparian woodland, this species roosts communally in tree hollows or dense foliage. It is dependent on retention of a range of roosting sites (Parnaby 1995) | • medium likelihood<br>• may be casual forager in the Tweed region | negligible |
| *Sousa chinensis* | Indo-Pacific Humpbacked Dolphin | Occurs in shallow coastal waters, including the mouth of large rivers and off ocean beaches (Corkeron 1995). | • low likelihood | negligible |

## Flora Area List

| Scientific Name | Common Name | Habitat Requirements | Likelihood of occurrence in study area | Possible effects from bypassing |
|---|---|---|---|---|
| Lauraceae | *Cryptocarya foetida* | Species known to occur within littoral rainforest (Williams *et al.* 1984) | • very low likelihood<br>• lack of suitable microclimate | negligible |
| Myrtaceae | *Syzygium moorei* | Species known to occur within lowland subtropical rainforest (Williams *et al.* 1984) | • very low likelihood<br>• lack of suitable microclimate | negligible |
| Rubiaceae | *Randia moorei* | Species known to occur within subtropical rainforest (Williams *et al.* 1984) | • very low likelihood<br>• lack of suitable microclimate | negligible |
| Rutaceae | *Acronychia littoralis* | Species known from littoral rainforest on sand (Williams *et al.* 1984) | • very low likelihood<br>• lack of suitable microclimate | negligible |

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# ATTACHMENT 2

## References Used in Attachment 1


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# TWEED RIVER ENTRANCE SAND BYPASSING PROJECT EXTENSION OF AVIFAUNA IMPACT ASSESSMENT TO INCLUDE THREATENED SPECIES SURVEY LETITIA SPIT


| | |
|---|---|
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| *Title:* | Tweed River Entrance Sand Bypassing Project - Extension of Avifauna Impact Assessment to include Threatened Species Survey Letitia Spit |
| *Author:* | Dr Rick Morton |
| *Client:* | NSW Department of land and Water Conservation c/- Kinhill Pty Ltd |
| *Client Contact:* | Dr Tom Connor (Kinhill) |
| *Client Reference:* | |
| *Synopsis:* | This report provides a response to issues raised by the NSW Department of Urban Affairs and Planning with regard to threatened species surveys on Letitia Spit near the entrance to the Tweed River. The study forms part of the approvals process associated with the Tweed River Entrance Sand Bypassing Scheme. |

## REVISION/CHECKING HISTORY

| REVISION NUMBER | DATE | CHECKED BY | | ISSUED BY | |
|---|---|---|---|---|---|
| 0 | 19/5/98 | Terry Reis | | Dr Rick Morton | |

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# LIST OF FIGURES

# 1 INTRODUCTION

## 1.1 Background

An Environmental Impact Statement was submitted for the proposed Tweed River Entrance Sand Bypassing System. As part of the EIS review process, issues were raised with regard to the potential presence of threatened species listed under the Threatened Species Conservation Act (NSW), along Letitia Spit near the entrance to the Tweed River.

A series of discussions were held with NSW National Parks and Wildlife Service (NPWS) to identify species that may be affected as a result of some of the options for sand by-passing. A series of 8-part tests were undertaken on various avifauna species utilising the adjacent beach (South Head Beach) that potentially could be influenced by the system. These indicated that, providing certain constraints to specific bypass options were observed, the construction of a sand bypassing system would not result in any adverse effects to avifauna species listed under that Act.

Following a review by WBM of flora and fauna threatened species that are listed on the NSW NPWS database for the region, the Department of Urban Affairs and Planning (DUAP) has requested extension of the Avifauna Impact Assessment Study to assess, in detail, potential impacts on other flora and fauna threatened species. This investigation forms the basis of this report.

## 1.2 Letitia Spit Historical Considerations

In considering flora/fauna issues at Letitia Spit, it is important to recognise:

- Letitia Spit was subject to extensive sand mining which removed all of the original vegetation and modified soil structure. Following cessation of sand mining in the late 1970's, miners replanted specific areas with Casuarina and Bitou Bush. Since that time other species (eg. *Banksia*) have naturally colonised the site. There appears to also have been some sporadic recent planting of eucalypt species in discrete areas.
- The beach has prograded markedly since 1962. The two outer training walls were constructed in the 1962-65 period and since then sand has accumulated in areas adjacent to the walls and extended the shoreline seawards by up to about 300 m. The existing road through Letitia Spit reflects the approximate foredune position in the 1970's. Evidence of Casuarina replanting on the foredune is obvious from aerial photography (regular lines of trees adjacent to the road).

The relatively recent period of disturbance and beach accretion ensures that any vegetation communities (and hence fauna habitats) within areas potentially influenced by the bypassing system have only been present for a short time (approximately 10 to 25 years).

# 2 SCOPE OF STUDIES

## 2.1 Study Objective

The objective of this report is to present the results of the detailed flora/fauna survey on Letitia Spit targeting species listed on the Threatened Species Conservation Act and listed in Appendix A.

DUAP requested that: particular survey effort be afforded to the Wallum Froglet, the Long-nosed Potoroo and the Queensland Blossom bat; the survey be conducted over two consecutive days and nights; and, that a vegetation map was produced of the study area. Additionally, the Department requested a number of other supplementary issues be addressed.

# 3 FLORA

## 3.1 Methodology

The vegetation present on Northern Letitia Spit was first assessed by review and interpretation of aerial photographs (1998, 1994). These were used to distinguish differences in broad vegetation types and to identify vegetation extent and general distribution across the area.

A vegetation survey was then undertaken, involving traversal of each identified broad vegetation type. All areas of northern Letitia Spit (area shown in Figure 3.1) were searched with particular emphasis being placed upon areas likely to be affected by bypass system infrastructure. Specific vegetation types were then identified, along with the dominant plant species present in each type. Searches for littoral rainforest habitat were also undertaken, specifically targeting four threatened rainforest species identified previously as occurring within 10km of the study area, namely:

- *Cryptocarya foetia*;
- *Syzygium moorei*;
- *Randia moorei*; and
- *Acronychia littoralis*.

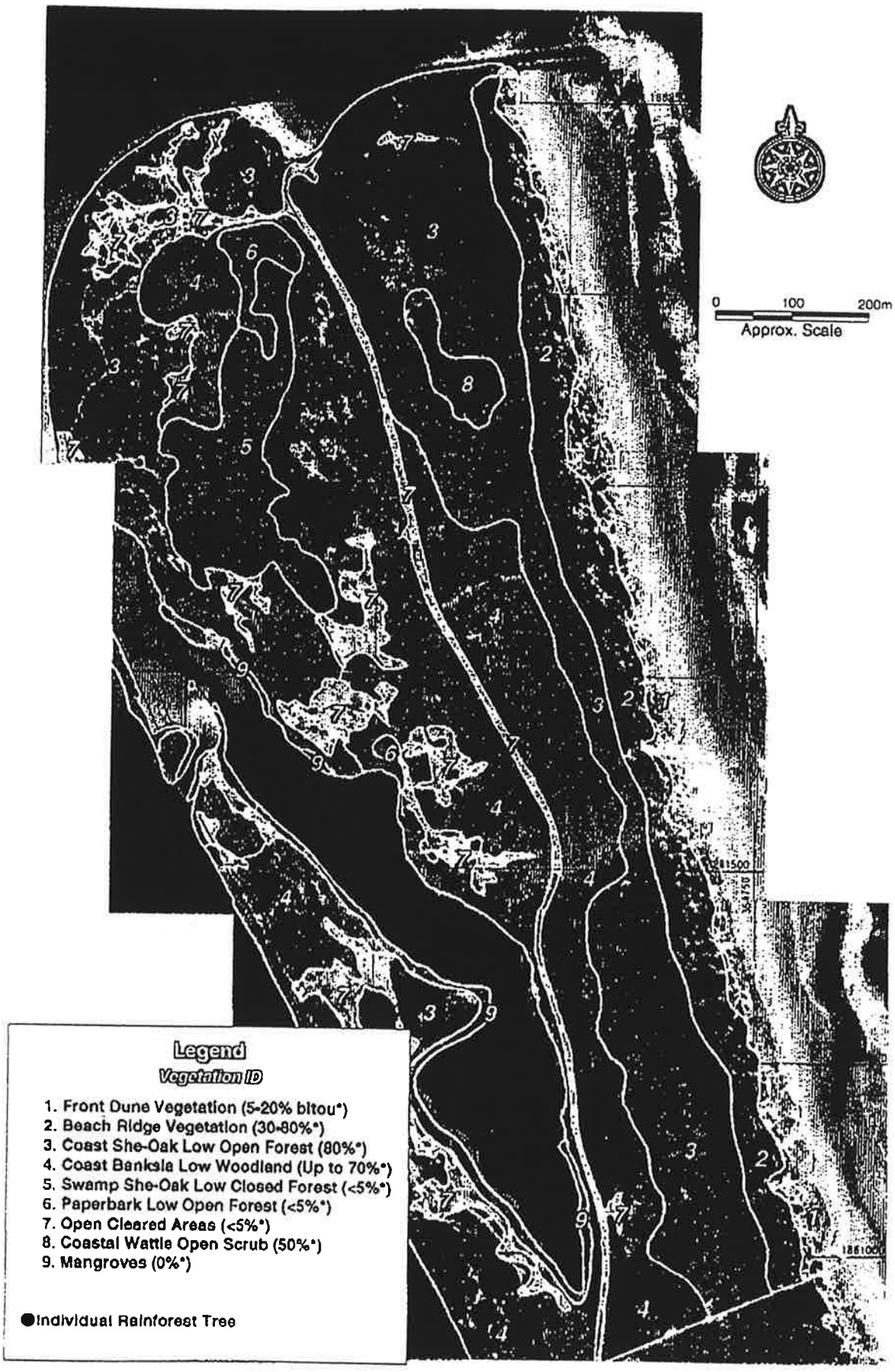
A vegetation map was produced, based on the 1998 air photo (digital) base layers. The vegetation types identified are described in Section 3.2 below.

## 3.2 Results

Nine specific vegetation types were identified within the site, namely:

- front dune vegetation;
- beach ridge vegetation;
- coast she-oak low woodland;
- swamp she-oak low closed forest;
- paperbark low open forest;
- coast banksia low open forest;
- open cleared areas;
- coastal wattle open scrub; and
- mangroves.

The location and extent of these vegetation types are mapped in Figure 3.1 and each is described briefly below.




## Vegetation Map - Letitia Spit Site

(*Numbers indicate percent cover of bitou bush occurring in each vegetation type)

Figure 3.1

### 3.2.1 Front Dune Vegetation

Low, groundcover species typical of the front (most sea-wards) dune formed this vegetation type, including dune spinifex (*Spinifex hirsuta*) (70% cover), sea bean (*Canavalia rosea*) (20% cover) and sea purslane (*Sesuvium portulacastrum*) (5% cover). Bitou bush (*Chrysanthemoides monilifera*) (5-20% cover) was also present in places as a low-growing, spreading shrub.

### 3.2.2 Beach Ridge Vegetation

The eastern face of the first beach ridge (ie, behind the front dune) contained a low open forest dominated by coast she-oak (*Casuarina equisetifolia*) (30-70% cover) to 4m-6m tall, with occasional coast banksia (*Banksia integrifolia*) (5-10% cover) and coastal wattle (*Acacia sophorae*) (10-20% cover) specimens present as tall shrubs and/or small trees of a similar size. Bitou bush (30-80% cover) dominated the lower shrub layer and groundlayer, ranging from 0.5m-2m tall. Also present in the groundlayer were occasional grasses and succulent herbs, including sea purslane and pigface (*Carpobrotus glaucescens*) (up to 5-10% cover each).

### 3.2.3 Coast She-oak Low Open Forest

From the top of the first beach ridge and to the west occurred a low open forest dominated by coast she-oak (30-70% cover), with other common canopy and sub-canopy species present including coast banksia (5-10% cover), coastal wattle (10-20% cover), coast teatree (*Leptospermum laevigatum*) (10-20% cover) and sweet wattle (*Acacia suaveolens*) (up to 5% cover). Towards the western side of the Spit, cotton trees (*Hibiscus tiliaceous*) (up to 10% cover) were relatively common, and occasional young (less than 5m tall) blue gum (*Eucalyptus tereticornis*) and swamp mahogany (*E. robusta*) specimens were also present (up to 5% cover each).

The understorey and groundlayers contained dense patches of bitou bush (80% cover), with a range of other species also present in places, including macaranga (*Macaranga tanarius*) (up to 5% cover), guinea flower (*Hibbertia scandens*) (up to 5% cover), sand burr (*Cenchrus echinatus*) (less than 5% cover) and cosmos (*Cosmos bipinnatus*) (up to 10% cover).

### 3.2.4 Coast Banksia Low Woodland

Coast Banksia (30-70% cover) dominated a low woodland which covered portions of the lower-lying flat areas of the site, to the west of the main dunal area. Other canopy species occasionally present included swamp she-oak (*Casuarina glauca*) (up to 5% cover), macaranga (up to 5% cover), and paperbark teatree (less than 5% cover), while bitou bush (up to 70% cover) and coastal wattle (30% cover) dominated the shrub and ground layers. Exotic grasses, herbs and vines were also common in the groundlayer of this vegetation type (up to 5% cover each).

### 3.2.5 *Swamp She-oak Low Closed Forest*

A number of relatively low-lying areas contained dense stands of swamp she-oak. The understorey in such areas was largely absent, and the groundlayer was made up of scattered sedges and grasses (up to 30% cover). There was a little (less than 5%) bitou bush growth present in this vegetation type.

### 3.2.6 *Paperbark Teatree Low Open Forest*

Areas fringing the swamp she-oak low closed forest contained stands dominated by paperbark teatree (*Melaleuca quinquenervia*) (60% cover), with coast banksia (10% cover), swamp she-oak (20% cover) and willow bottle brush (*Callistemon salignus*) (up to 5% cover) also common, and young (less than 5m tall) blue gum and swamp mahogany occasionally present in some places (less than 5% cover). There was little bitou bush (less than 5%) growth present in this vegetation type.

### 3.2.7 *Open Cleared Areas*

A number of areas were largely clear of vegetation, with only grasses, herbs and occasional shrubs present over the exposed sand. Bitou bush was present as only scattered shrubs (less than 5% cover).

### 3.2.8 *Coastal Wattle Open Scrub*

A relatively small patch dominated by coastal wattle (50% cover) and bitou bush (50% cover) occurred within the coast she-oak low open forest towards the northern end of the site (see Figure 3.1). These two species were growing very tightly packed together, forming an almost unbroken layer of vegetation some 2m-4m deep.

### 3.2.9 *Mangroves*

Grey mangrove (*Avicennia marina*) (30-70% cover) dominated the narrow fringe of mangroves which was found to occur around the margins of Kerosene Inlet.

## 3.3 Discussion

Northern Letitia Spit was dominated by common coastal plant species which had regrown since disturbances in the site's past. Much of the site contained a dense layer of bitou bush (an exotic and invasive weed) in the understorey and ground layers. In some areas towards the northern portion of the spit, the initial regrowth is reaching over-maturity (ie. senescing), and little regeneration of native species appears to be occurring through the dense understorey layers of bitou bush.

If the present growth trends continue, it is likely that large areas of coast she-oak low open forest will eventually be replaced with dense bitou bush shrublands.

No remnant littoral rainforest was identified on the site. One individual plant of each of five different species which are typically associated with littoral rainforest communities were

identified within the coast banksia low woodland area (see Figure 3.1), namely guioa (*Guioa semiglauca*), three-veined cryptocarya (*Cryptocarya triplinervis*), beach alectryon (*Alectryon coriaceus*), silver aspen (*Acronychia wilcoxiana*) and red-fruited kurrajong (*Sterculia quadrifida*). None of these are rare or threatened plant species. Also, all of these were located beyond 1km of the southern training wall and well landward of the front dune. There would be no impacts of works on the areas where these plants were located.

None of the target plant species (the four threatened rainforest species) were located on the site during the survey.

There were also no mature trees bearing hollows suitable for fauna habitat (nesting) located on the site during the survey. The vegetation types present (*Banksia* and bitou bush) are unlikely to produce hollows even in the most mature plants.

The relative dominance on the site of the coast banksia is of some significance to fauna, and this issue is considered in Section 4.0.

# 4 FAUNA

## 4.1 Methodology

The study site was surveyed for those species listed in Appendix A with an emphasis placed upon three target species, Long-nosed Potoroo (*Potorous tridactylus*), Queensland Blossom-bat (*Syconycteris australis*) and Wallum Froglet (*Crinia tinnula*), from April 28 to April 30, 1998 by a qualified and experienced terrestrial ecologist.

The following survey techniques were employed.

- Spotlighting with a headlamp and 30 watt portable spotlight both on foot and from a vehicle for three hours on each of two nights.
- Playback of the call of the Wallum Froglet during spotlighting events.
- Diurnal searches at dawn and in the late afternoon over three days.
- Searches for scats, feeding sites, shelters, pathways, tracks and other signs during all visits to the survey site.

All vegetation types (Fig. 3.1) were traversed during the survey with particular emphasis placed on the north-eastern portion of Letitia Spit.

## 4.2 Results

The nomenclature used in this report, unless otherwise noted, follows Strahan (1995) for mammals and Cogger (1994) for herpetofauna. However, the Common Blossom-bat (*Syconycteris australis*) will be referred to by its alternate common name, the Queensland Blossom-bat.

## 4.3 Target Species

This survey found no evidence of any of the three target species being present on Letitia Spit at the time of undertaking.

## 4.4 Additional Species of Significance

Black Flying-fox (*Pteropus alecto*), a species listed as Vulnerable under the New South Wales *Threatened Species Conservation Act 1995*, was recorded during both spotlighting events. This species was observed feeding in *Banksia integrifolia* with in excess of ten individuals present in the study area on each night. Black Flying-foxes were mainly recorded in vegetation type Coast Banksia Low Open Forest (Fig. 3.1), although individuals were observed in flight throughout the study site with the exception of vegetation types Front Dune Vegetation and Beach Ridge Vegetation (Fig. 3.1).

## 4.5 Discussion

### 4.5.1 *Target Species*

**Long-nosed Potoroo** (*Potorous tridactylus*)

The Long-nosed Potoroo, a species listed as Vulnerable under the New South Wales *Threatened Species Conservation Act 1995*, inhabits coastal heath and wet and dry sclerophyll. Its major habitat requirement is thick ground cover, particularly on sandy soils (Johnston 1995).

Bitou Bush (*Chrysanthemoides monilifera*), an exotic species, dominated the ground layer in much of the study site (refer to Section 3.2) and may offer some of the structural habitat requirements of the Long-nosed Potoroo. However, the study site does not include a recognised habitat type (coastal heath/wetland dry sclerophyll) for this species and any possible suitability is undermined by ongoing disturbance by the presence of exotic species and domestic animals and by human activity, day and night.

This nocturnal species is threatened by foxes, dogs and cats (Van Dyck 1995) and the presence of dogs and foxes on Letitia Spit was indicated by their tracks along the sandy tracks traversing the study site and in sandy clearings. Long-nosed Potoroos forage by digging small holes, searching for fungi, roots, tubers and insects (Johnston 1995; Triggs 1996). These diggings may be confused with those of bandicoots (Family Peramelidae), however the only diggings located during the survey were by dog or fox.

There were no scats, other than dog or fox, found during the survey. However, the scats of Long-nosed Potoroos are difficult to find due to their small size. They are often deposited near their feeding sites. Potoroos shelter in depressions scraped out under shrubs or in grass tussocks and although their tracks may be mistaken for those of bandicoots, there are differences in the shape and placement of the front foot tracks (Triggs 1996). There was no evidence of the shelters or tracks of Long-nosed Potoroos in the study site during this survey. The sandy nature of the study site made it particularly suitable of searching for tracks.

Although this species is rarely seen (Van Dyck 1995) and its presence cannot be discounted, the study site appears to offer little by way of suitable habitat and the likelihood of its occurrence in the study site is considered to be extremely low.

**Queensland Blossom-bat** (*Syconycteris australis*)

The Queensland Blossom-bat, a species listed as Vulnerable under the New South Wales *Threatened Species Conservation Act 1995*, occurs along the eastern coastline as far south as Coffs Harbour, New South Wales (Hall and Martin 1995) and northwards into New Guinea. In the southern part of the species range the Queensland Blossom-bat is a specialist blossom-feeder and favours *Banksia*, *Melaleuca*, *Callistemon* and certain *Eucalyptus* species, particularly within heathland and *Melaleuca* swamps (Law and Spencer 1995).

Queensland Blossom-bats, with flying-foxes, belong to the sub-order Megachiroptera and do not echo-locate. Their excellent night vision and sense of smell are used to locate food (Hall and Martin 1995). The species is known to feed on the blossoms of *Banksia integrifolia*, a species flowering within the study site during this survey, and Blossom-bats may travel up to four kilometres from a roosting site to a food resource (Law and Spencer 1995).

This species has been recorded, on occasions, in the Tweed region by the New South Wales National Parks and Wildlife Service and may forage in the Letitia Spit region despite not being recorded during this survey. Whilst Blossom-bats are small, mouse-sized bats and may be overlooked, the species does have bright eyeshine in a spotlight beam (author pers. obs.) and are certainly able to be located by spotlighting in the field.

In New South Wales, the Queensland Blossom-bat favours coastal rainforest as a roosting area, with the roost usually being adjacent to a heathland feeding area. Whilst the study site contains a food resource of the species (*banksia*), it lacks and the critical feeding habitats of heathland and *Melaleuca* swamps (Law and Spencer 1995), and the preferred roosting habitat, rainforest.

Although the vegetation types present in the study site (refer Fig. 3.1) are not suitable for roosting purposes, portions of northern Letitia Spit contain vegetation which could provide a feeding habitat. The potential usage of this area would presumably be less than for more favoured feeding habitats (eg. heathland) which occurs extensively in the Tweed region. Even if this bat species was to utilise the northern portions of Letitia Spit, it is unlikely to be disturbed in its feeding routine by the presence of humans and vehicles (Law pers. comm.).

**Wallum Froglet** (*Crinia tinnula*)

The Wallum Froglet is one of a group of small, terrestrial frog species whose positive identification is often based on the call of the male (Cogger 1994). It is restricted to coastal regions in southern Queensland and northern New South Wales and breeds in the acidic waters of wallum and *Melaleuca* wetlands (Barker *et al.* 1995; Czechura 1995).

The Wallum Froglet is listed as Vulnerable under the New South Wales *Threatened Species Conservation Act 1995* and has been recorded by the New South Wales National Parks and Wildlife Service in the Tweed region.

It has specific habitat requirements, wallum and *Melaleuca* wetlands, which do not occur within northern Letitia Spit (refer to Section 4.2). Indeed, there was no standing freshwater in any vegetation type within the study site and it is unlikely to occur given the site topography and the presence of sandy soils which would enhance freshwater infiltration. Despite the lack of appropriate habitat the taped call of the species was played on a number of occasions in the most likely of habitats, with no response.

Whilst this lack of response could be attributed to the species being a late winter breeder (Robinson 1993; Cogger 1994), the lack of apparent habitat would preclude its occurrence in the study site.

### 4.5.2 Additional Significant Species

4.5.2.1 Additional Significant Species Recorded

**Black Flying-fox (*Pteropus alecto*)**

The Black Flying-fox, listed as Vulnerable under the New South Wales *Threatened Species Conservation Act 1995*, was recorded during both spotlighting events of this survey. This species was observed in flight over the study site and feeding in *Banksia integrifolia* with in excess of ten individuals present in the study area on each night.

Consequently, an eight part test has been provided below preceded by an overview of the species ecology.

*Ecology*

Status: The Black Flying-fox is common in Australia (Hall 1995). Considered from an international perspective this species is graded 'Not Threatened'. Although flying-fox populations in New South Wales have declined since European settlement, the Black Flying-fox is still considered to be abundant in New South Wales (Eby 1995).

From a NSW State perspective, the classification of 'Vulnerable' is "*primarily a result of the restricted range of P.alecto in NSW and the process which only considered its status within N.S.W. It does not reflect the status of the population as a whole.*" (Eby 1995: 14).

The Black Flying-fox is not listed as Endangered, Vulnerable or Rare under the Queensland *Nature Conservation (Wildlife) Regulation 1994* and is considered to be common in adjacent habitat within Queensland and, indeed, throughout its range within Australia (Eby 1995; Hall 1995).

Habit: The preferred food of this species is nectar from the blossoms of eucalypts and paperbarks but the Black Flying-fox also feeds on fruits, leaves, bark and seeds in a variety of habitats including rainforest, mangroves and swamps (Eby 1995; Hall 1995). The Black Flying-fox will travel up to 50 kilometres from a 'camp', a communal roost, to a feeding site (Hall 1995).

Specific Habitat Requirements: Black Flying-foxes roost in large aggregations, 'camps', commonly located in rainforest, *Melaleuca* swamps or in stands of *Casuarina cunninghamiana* (Eby 1995). This is a high-roosting species and it prefers dense leaf cover (Hall 1995).

Distribution: Within Australia the Black Flying-fox is found in Western Australia, the Northern Territory, Queensland and New South Wales. Within New South Wales their range is restricted to the far north-eastern corner. Historical records indicate a recent extension of range into New South Wales and the species has been recorded as far south as Maclean (Eby 1995).

Breeding: Generally the Black Flying-fox breeds seasonally, with most females conceiving each year and giving birth to a single offspring. Birth usually occurs in October or November and, due to a long gestation period, the maximum annual reproductive rate is one (Eby 1995).

***Eight Part Test***

*a) In the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

The proposed sand bypassing project, regardless of the final option, should not affect any part of the life cycle of the Black Flying-fox including its breeding requirements and feeding habits.

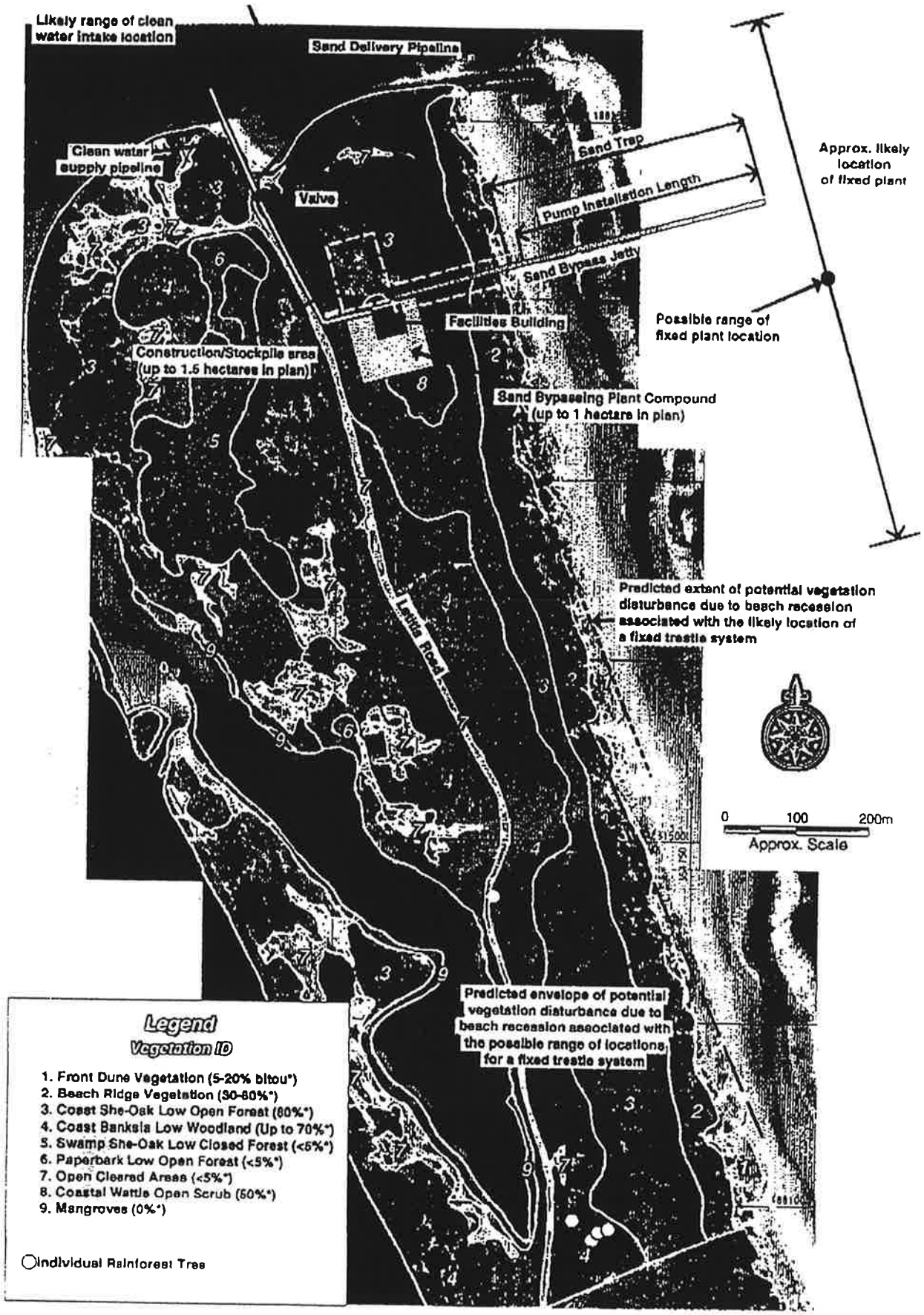
The Black Flying-fox breeds within communal roosts, (camps), which, in New South Wales, are typically located in rainforest, Melaleuca swamps or in stands of *Casuarina cunninghamiana* (Eby 1995). There is no camp currently located within the study site nor is there is any suitable roosting habitat within the study site in which a breeding camp would be formed in the future.

The Black Flying-fox prefers to feed on nectar from the blossoms of eucalypts and paperbarks but also feeds on fruits, leaves, bark and seeds in a variety of habitats, including rainforest, mangroves and swamps (Eby 1995; Hall 1995). The species typically has a wide ranging feeding area, flying up to 50 kilometres from a camp to a feeding site (Hall 1995).

The proposed bypassing project may (depending upon the option selected) involve the loss of up to one hectare of vegetation within the Northern Letitia Spit for a bypass plant and perhaps the temporary removal of up to 1.5 ha for construction works The plant (and construction area) would be situated on the seaward side of the road (Figure 4.1) and some *Bankisa integrifolia*, on which the species was observed feeding during this survey, may be removed as a consequence. The exact location of the bypassing plant cannot be confirmed at this stage. There is a possibility, depending upon the bypassing system selected, that the infrastructure could be situated such that it would not involve disturbance of any *Banksia integrifolia*.

Even if the infrastructure was to be located exclusively within the *Banksia* community, this would have a minimal impact upon the feeding habits of the Black Flying-fox as:

- substantial areas of feeding habitat (eg. *Banksia* communities) will remain on Letitia Spit;
- the species is known to feed on a diversity of foods over a wide area (may fly 50km from a camp to feeding site);
- areas subject to temporary disturbance would be rehabilitated and extensive landscaping program using local native species (including *Banksia*) implemented following construction activities; and
- suitable food sources occur throughout the Tweed region.




**Proposed Works in Relation to Vegetation**

**Figure 4.1**

Once constructed, the bypass plant and any consequent human activity would not affect the species as flying-foxes are generally undeterred by human presence (Eby 1995).

*b) In the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised.*

No endangered populations are recorded from this locality.

*c) In relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed.*

The proposed sand bypassing project could have various effects on Letitia Spit depending upon the bypassing option selected. The possible effects are:

- increased recreational use of the area;
- infrastructure construction and maintenance; and
- foreshore retreat.

Increased recreational use of the area will primarily occur during the day, although some fishers may use the beaches at night. The Black Flying-fox is a nocturnal species and therefore should largely be unaffected. Even if fishers were to disturb feeding bats, this is not of concern as the species are generally undeterred by human activity (Eby 1995).

The possible removal of up to one hectare of vegetation within the study site for a bypass plant may include the loss of some feeding habitat, specifically *Banksia integrifolia*. However, this would have a minimal impact upon the regional distribution of the habitat of Black Flying-fox. As noted above, the species feeds on a diverse range of food sources all of which are widespread in the Tweed region.

Foreshore retreat would primarily involve front dune and beach ridge vegetation which does not provide significant habitat for Black Flying-fox.

*d) Whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.*

Although Letitia Spit may be modified for a period of time (depending on which bypassing system is chosen), areas of habitat on Letitia Spit and throughout the Tweed region will remain accessible to this highly mobile species.

*e) Whether critical habitat will be affected.*

No critical habitat has been recorded for this location.

*f) Whether a threatened species, population or ecological community, or their habitats are adequately represented in conservation reserves (or other similar protected areas) in the region.*

Although the Black Flying-fox is still considered to be abundant in New South Wales and appears to be extending its range southwards (Eby 1995), the species is not currently adequately represented in northern New South Wales conservation reserves or other protected areas.

*g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.*

Because the area of habitat to be affected will be a minimal proportion of available feeding habitat, regardless of the final option chosen, the proposed development is not regarded as threatening with regard to the continued survival of the Black Flying-fox.

*h) Whether any threatened species, population or ecological community is at the limit of its known distribution.*

The Black Flying-fox in northern New South Wales is not at the limit of its known distribution. The species is regularly recorded at Lismore and is reportedly expanding its range south (Eby 1995).

## Conclusions

None of the potential options for the proposed sand bypassing project will significantly affect Black Flying-fox populations (listed as Vulnerable on Schedule 2 of the NSW *Threatened Species Conservation Act*, 1995) that currently use Letitia Spit.

The Black Flying-fox does not roost or breed on Letitia Spit, nor is there suitable habitat for the likely formation of roosts in the future. Although the species is known to forage on the site, the possible removal of a very small amount of *Banksia integrifolia* will have no impact on the regional food resources of the Black Flying-fox and there will be no significant impact on the biology or habitat of the species.

An SIS for the Black Flying-fox is therefore not required regardless of any options for the sand bypassing works.

### 4.5.2.2 Additional Species of Significance Which May Occur in the Tweed Region

DUAP requested that information be provided on the following species.

***Biology of Beccari's Freetail-bat (Mormopterus beccarii)***

**Habitat and Range**

Beccari's Freetail-bat occurs across northern Australia, as far south as northern NSW, and extralimitally in Indonesia and New Guinea. It occurs in a wide variety of habitats, from desert and semi-arid regions to eucalypt forest and coastal rainforest. It is particularly associated with watercourses and with paperbark and pandanus (McKenzie 1995). However, it also occurs in cleared land (Hall and Martin 1995).

In NSW, records are mainly from dry sclerophyll forest and woodland (NSW NPWS 1998).

**Foraging**

This species hunts flying insects above the tree canopy and along river courses, usually approaching the ground only over pools. Flightless insects are also included in its diet, Freetail-bats being capable of movement on the ground (McKenzie 1995).

**Breeding**

Throughout its range, female Beccari's Freetail-bats give birth to a single offspring during summer (McKenzie 1995).

**Roosting**

This species usually roosts in tree hollows, but has been found in colonies of more than 100 in the roofs of houses in Brisbane (Hall and Martin 1995).

**Status**

Beccari's Freetail-bat is listed as Vulnerable on Schedule 2 of the *NSW Threatened Species Conservation Act*, 1995. Overall it is considered to be common in suitable habitats (McKenzie), though there are few records in NSW (NSW NPWS 1998). Northern NSW is the southern edge of the species' range.

**Conclusions**

Beccari's Freetail-bat is a common species over most of its Australian range and is found in a wide variety of habitats. Its presence in houses in Brisbane indicates that it is not easily disturbed by humans. It is susceptible to modification of roosting habitats, especially the loss of tree hollows. However, Letitia Spit does not contain tree hollows or indeed any tree species likely to provide hollows in the future.

It is therefore very unlikely that the species roosts or breeds in the site. Given that most records in NSW are from dry sclerophyll and that this vegetation type does not occur on Letitia Spit, it is not likely that the species forages over the site, however, should it do so, the proposed bypassing project would, at worst, have a negligible impact due to slight habitat alteration.

*Biology of Little Bentwing-bat (Miniopterus australis)*

**Habitat and Range**

The Little Bentwing-bat occurs in Queensland and NSW, and extralimitally in New Guinea, New Caledonia and the Philippines (Dwyer 1995). In NSW the species is recorded as far south as Kempsey and is largely restricted to coastal areas (NSW NPWS 1998).

Habitats include rainforest, melaleuca swamps and dry sclerophyll (Dwyer 1995).

**Foraging**

This species forages for small insects above, in and below the canopy (Hall and Martin 1995), of rainforest, melaleuca swamps and dry sclerophyll. Generally the habitats are well-timbered (Dwyer 1995).

**Breeding**

Nursery colonies, often shared with Common Bentwing-bat (*Miniopterus schreibersii*), are typically located in caves. Births occur in December (Dwyer 1995).

**Roosting**

The Little Bentwing-bat roosts in caves, mines, tunnels and culverts (Tanton 1996).

**Status**

Little Bentwing-bat is listed as Vulnerable on Schedule 2 of the *NSW Threatened Species Conservation Act*, 1995. However, the Little Bentwing-bat is considered to be abundant over its Australian range (Dwyer 1995). In fauna surveys conducted in the nearby Murwillumbah management area the Little Bentwing-bat was "*relatively very abundant*" (Tanton 1996: 473).

**Conclusions**

The major conservation concern for the Little Bentwing-bat is disturbance at overwintering and nursery sites (Dwyer 1995). There are no suitable sites such as caves, tunnels, or culverts on Letitia Spit and the site, not being particularly well-timbered or containing rainforest, melaleuca swamps or dry sclerophyll, is unlikely to be a foraging site. Should the Little Bentwing-bat forage on Letitia Spit occasionally, the proposed bypassing project would have little or no effect on the species as there would be minor habitat alteration.

*Biology of Eastern Long-eared Bat (Nyctophilus bifax)*

**Habitat and Range**

The Eastern Long-eared Bat occurs in northern Australia, as far south as northern NSW (Parnaby 1995). Habitats include rainforest, dry sclerophyll and dense vegetation along watercourses, with rainforest the most critical habitat in northern NSW (Tanton 1996).

**Foraging**

This species feeds on insects taken in flight and gleaned from foliage, as well as taking prey from the ground (Tanton 1996).

**Breeding**

The Eastern Long-eared Bat roosts in hollows, under bark and in dense foliage, however lactating females are more likely to frequent hollows (Tanton 1996). Females often produce twins which are carried initially, then, when sufficiently large, are left in the maternity roost (Parnaby 1995).

**Roosting**

This species roosts communally in tree hollows, dense foliage, under peeling bark, in epiphytes and between strangler figs and their host trees (Tanton 1996). Roosting sites vary from the edges of rainforest in summer to the centre of rainforest remnants in winter.

**Status**

The Eastern Long-eared Bat is considered to be common and widespread in tropical coastal Australia and localised in subtropical areas (Parnaby 1995). In northern NSW it can be quite common in rainforest at low altitudes and has been "*one of the most frequently captured bats in north coastal New South Wales*" (Tanton 1996:485).

**Conclusions**

The lack of rainforest on Letitia Spit severely limits the likelihood of the Eastern Long-eared Bat roosting or breeding in the study site. Similarly, because there is no rainforest, the species is unlikely to forage on Letitia Spit and, if the species was to occur occasionally, the proposed bypassing project would have little or no impact on its biology or habitat.

# 5 ADDITIONAL ISSUES

DUAP, in its facsimile of 9 April 1998, suggested that information should be provided on:

- the likelihood of Green turtles (*Chelonia midas*) using the study area for breeding should be provided; and
- Little Terns/Pied Oystercatchers nesting in the Tweed Estuary.

## 5.1 Green Turtle Nesting

Distribution records for this species indicate that it does not occur in NSW. In this regard, it is improbable that the species would be near Tweed Heads as this would be at, or near, the southern limit of its range.

Liaison was undertaken with Mr Lance Tarvey of the National Parks and Wildlife Service (Alstonville office), with regard to this issue. Mr Tarvey advised that the closest record of Green turtle nesting was one individual at Coffs Harbour. There have been no reports of Green turtles nesting at South Head Beach or anywhere within the Tweed region. However, other species of turtles (eg. loggerhead) have been recorded nesting, on occasions, at Kingscliff and Fingal Heads.

## 5.2 Impacts to Little Terns and Pied Oystercatchers within the Tweed Estuary

### *5.2.1 Little Tern*

The Little Tern species management report (Smith 1990) notes that in NSW the Little Tern only nests on or near the coasts. It recognises that some nesting may occur within estuaries distanced from the sea, but these are uncommon. Most nesting occurs on sand spits or sand islands where rivers and creeks enter the sea.

The Little Tern Management Plan and liaison with NSW National Parks and Wildlife indicates that the available records with regard to Little Tern presence on South Head Beach also apply to the estuarine situation. That is, no breeding pairs have been recorded from South Head Beach or anywhere else within the Tweed Region for at least 15 years. Furthermore, the potential for future nesting to occur within the Tweed Estuary is highly unlikely given the urbanised nature of the estuary and the high volume of recreational traffic that occurs on all sand spits, etc in the region. Furthermore, no previous records suggest that nesting has ever occurred within the Tweed Estuary.

Consequently, the negligible changes in tidal levels within the estuary as a result of the bypassing operation are unlikely to affect Little Tern nesting within the estuary given that this does not occur.

### 5.2.2 *Pied Oystercatcher*

A 12 month bird monitoring program was undertaken for areas within the Tweed Estuary and near the Tweed River entrance (WBM 1996). No instances of Pied Oystercatchers were observed throughout the study.

Despite attempting to contact a variety of researchers for further advice, none were aware of Pied Oystercatcher breeding within the Tweed River estuary. Mr Lance Tarvey (NPWS, Alstonville Office) sought further advice on this issue from local bird researchers, none of which were aware of Pied Oystercatchers nesting in the estuary.

However, this possibly would seem unlikely for similar reasons to the Little Tern. That is, the lower Tweed Estuary is subject to high levels of recreational usage. Pied Oystercatchers typically nest on sand, shell-grit or shingle above high-water mark (Marchant and Higgins 1993). Nesting within/beside saltmarsh and mudflats has also been recorded. These habitat types are subject to frequent usage by shore-based anglers throughout the Tweed Estuary who would be likely to disturb nests and limit (if not prevent) nesting success.

Consequently, the negligible changes in tidal levels within the estuary as a result of the bypassing operation are unlikely to affect Pied Oystercatchers nesting.

## 5.3 Freshwater Intake

A freshwater intake may be sited at the northern most portion of Letitia Spit (see Figure 3.1). This region was subject to a detailed survey as part of the flora/fauna studies described in previous sections of this report.

The area is heavily disturbed as a result of recreational usage (vehicle traffic, anglers, swimmers, etc). Most vegetation (primarily Coast She-oak Low Woodland) is fragmented. Many trees are missing limbs presumably being used as a firewood by anglers who regularly (day and night) fish along this area.

The shoreline in the region where the intake point could be located comprises a steep rock revetment sloping down to a subtidal sandy bed which is highly mobile as a result of strong tidal flows. No intertidal sand banks are present that could potentially provide bird habitat.

Considering the degraded nature of vegetation present and continual disturbances from people using the area, it is highly unlikely that the region proposed for the freshwater intake would provide habitat for any plant or animal species listed under the Threatened Species Act.

# 6 OVERVIEW AND CONCLUSION

## 6.1 Flora

Northern Letitia Spit is dominated by common coastal plant species which have regrown since disturbances in the site's past (eg. sand mining). Much of the site contains a dense layer of bitou bush (an exotic and invasive weed) in the understorey and ground layers. This may limit the potential for regeneration of native plant species.

No littoral rainforest was identified on the site, and the vegetation types which were found on the site would not provide appropriate habitat for any of the four target threatened plant species. These species are not known to occur on the site, and were not located there during the site inspection.

It is possible that the site may be colonised by rainforest plant species in the future. However, it is likely that it will take a considerable time (decades, at least), before such colonisations establish a rainforest vegetation type with appropriate microclimatic conditions to support any of the four target threatened plants. The on-going presence of bitou bush may prevent rainforest seedlings colonising the area.

## 6.2 Fauna

The site survey did not locate any species or habitats that were not anticipated in the EIS or in discussions with NPWS. With regard to the three species (Wallum Froglet, Queensland Blossom-bat and Long-nosed Potoroo) which DUAP requested site specific information:

- none were observed during site surveys.
- the types of habitat found within the study site do not include the specialised habitat requirements of the Wallum Froglet (*Crinia tinnula*), nor do they provide the favoured roosting conditions of the Queensland Blossom-bat (*Syconycteris australis*). The Queensland Blossom-bat may, on occasion, forage within the study site but this is dependent on a suitable roost site being in reasonable proximity of the study site. Human activity potentially associated with the bypassing scheme, will not preclude any potential foraging by Blossom-bats in the future. The proposed scheme may result in some possible loss of feeding habitat (*Banksia integrifolia)* within a one hectare plot for the bypass plant, however any loss will result in minimal loss of food resources in the region utilised by this species.
- structurally the site provides the dense ground cover required by the Long-nosed Potoroo (*Potorous tridactylus*). However, other significant aspects of the study site appear to preclude the presence of this species. There was no evidence of the presence of Long-nosed Potoroo in the study site, but there was evidence of introduced predators in foxes and dogs and, combined with high levels of ongoing human activity both day and night, it is considered that the likelihood of the species occurring within the site is extremely low.

- site surveys located Black Flying-fox (a species listed under the Threatened Species Act) on-site. An 8 part test (see Section 4.5.2) indicated the bypassing scheme would not adversely affect this species.

Overall, the area of Letitia Spit influenced by the proposed bypassing scheme is highly unlikely to contain any species listed under the Threatened Species Act, other than those which have been discussed in this report, or for which 8 part tests have been conducted.

# 7 REFERENCES

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# APPENDIX A: RARE AND THREATENED SPECIES LISTED UNDER THE NEW SOUTH WALES *THREATENED SPECIES CONSERVATION ACT 1995* WHICH MAY OCCUR IN THE REGION.

| Species Name | Common Name |
|---|---|
| **Plants** | |
| *Crinia tinnula* | Wallum Froglet |
| *Chelonia mydas* | Green Turtle |
| *Puffinus carneipes* | Flesh-footed Shearwater |
| *Ixobrychus flavicollis* | Black Bittern |
| *Ephippiorhynchus asiaticus** | Black-necked Stork |
| *Lophoictinia isura* | Square-tailed Kite |
| *Pandion haliaetus** | Osprey |
| *Amaurornis olivaceus* | Bush-hen |
| *Calidris tenuirostris** | Great Knot |
| *Limosa limosa** | Black-tailed Godwit |
| *Xenus cinereus** | Terek Sandpiper |
| *Haematopus fuliginosus** | Sooty Oystercatcher |
| *Haematopus longirostris** | Pied Oystercatcher |
| *Charadrius leschenaultii** | Greater Sand-Plover |
| *Charadrius mongolus** | Lesser Sand-Plover |
| *Sterna albifrons** | Little Tern |
| *Ptilinopus regina* | Rose-crowned Fruit-Dove |
| *Tyto novaehollandiae* | Masked Owl |
| *Podargus ocellatus* | Marbled Frogmouth |
| *Todiramphus chloris* | Collared Kingfisher |
| *Lichenostomus fasciogularis* | Mangrove Honeyeater |
| *Monarcha leucotis* | White-eared Monarch |
| *Coracina lineata* | Barred Cuckoo-shrike |
| *Phascolarctos cinereus* | Koala |
| *Potorous tridactylus* | Long-nosed Potoroo |
| *Pteropus alecto* | Black Flying-fox |
| *Syconycteris australis* | Queensland Blossom Bat |
| *Mormopterus beccarii* | Beccari's Mastiff-bat (Freetail-bat) |
| *Miniopterus australis* | Little Bent-wing Bat |
| *Nyctophilus bifax* | Eastern Long-eared Bat |
| *Sousa chinensis* | Indo-Pacific Humpbacked Dolphin |
| | |
| **Family Name** | **Botanical Name** |
| **Flora** | |
| Lauraceae | *Cryptocarya foetida* |
| Myrtaceae | *Syzygium moorei* |
| Rubiaceae | *Randia moorei* |
| Rutaceae | *Acronychia littoralis* |

* Species for which 8 part tests have previously been completed

## *APPENDIX D*

*REVIEW OF FLORA AND FAUNA ASSESSMENT*

# Tweed River Entrance Sand Bypassing Project - Permanent Bypassing System

## Review of Flora and Fauna Impacts of the Proposed Works



## 1. Introduction

As part of its assessment of the proposed works associated with the Tweed River Entrance Sand Bypassing Project, the Department of Urban Affairs and Planning has undertaken a review of the flora and fauna assessment undertaken by the proponent. This review, which examined information contained in the Environmental Impact Statement (EIS), Representations Report and additional submissions by the proponent, has been undertaken to determine whether the proposed works are likely to have a significant effect on threatened species, populations or ecological communities or their habitats as defined in the *Threatened Species Conservation (TSC) Act, 1995*.

## 2. Summary of Flora and Fauna Assessment undertaken in the Environmental Impact Statement and Representations Report

The EIS identified that the key potential impacts of the construction and operation of the bypass system were the possible changes to the morphology of South Head Beach resulting in beach retreat of up to 90m, negligible tidal changes within the Tweed River Mouth and construction and operation effects at South Head Beach. South Head Beach was identified as one of the most important sites in the region for migratory and resident avifauna wader species. The EIS indicated that the impacts from changes to the tidal regime in the lower estuary would have a minimal impact on waterbirds. The proponent determined, in consultation with NPWS, that the only threatened species that were known to be present, or which were likely to be present, on intertidal sand and mudflats and exposed coastal beach habitats within the vicinity of the Tweed River mouth and South Head Beach were all bird species.

The EIS identified that together with a number of other species, the Little Tern, was known to use South Head beach as an important roosting habitat. The EIS proposed a

number of mitigation measures to protect the Little Tern population during construction and operation of the proposal including the following:

- undertaking the more disruptive construction activities during the winter period (between late April and early August) when the majority of the migratory wader species had returned to the northern hemisphere
- effective management of alternative roosts in the Tweed Estuary such as at Tony's Bar
- provision of fenced area at South Head Beach during construction works and implementation of a public education campaign

An eight-part test was undertaken for the Little Tern in accordance with Section 5A of the Environmental Planning and Assessment Act 1979. The EIS concluded that a Species Impact Statement (SIS) may be necessary depending on the option adopted and the associated infrastructure requirements and foreshore retreat.

An examination of terrestrial flora and fauna in the study area was also contained in the EIS. The area of primary importance in the study area in relation to terrestrial flora and fauna is Letitia Spit. The EIS undertook an assessment of the existing flora and fauna in this area and the potential impacts of the proposal. The EIS stated that the majority of the original dunal vegetation had been replaced as a result of extensive sand mining activities that had been undertaken between the 1930s and 1960s. The majority of the remaining vegetation consisted of species such as Horsetail Oak and exotic species dominated by Bitou Bush. Small stands of Coast Banksia were also identified. No species listed under the TSC Act were considered likely to occur on Letitia Spit. No site surveys were undertaken as part of the EIS.

The EIS indicated that impacts could occur as a result of provision of infrastructure associated with the fixed jetty mounted system and potential beach retreat of up to 90m. The EIS recognised that the proposal would result in vegetation disturbance, however, it was concluded that the potentially affected areas are of relatively low conservation and ecological significance. The EIS recognised that the existing vegetation played an important role in dune stabilisation and it was proposed to prepare a Dune Management Plan to address this issue.

The EIS identified a number of terrestrial fauna species that could possibly occur within the study area including some species listed under the TSC Act 1995: the Stephens Banded Snake, Queensland Blossom Bat, Koala and Long Nosed Potoroo. No fauna surveys of the Letitia Spit area were undertaken as part of the EIS and it was considered unlikely that any habitats of significant conservation value to fauna would be disturbed given the vegetation types present.

National Parks and Wildlife Service (NPWS) undertook a review of the avifauna assessment contained in the EIS and made a number of comments in its representation. NPWS indicated that a number of species that were identified in Section 4.5.3.3 and a number of other species that were known to occur in the area (Greater Sand Plover, Lesser Sand Plover, Osprey and Pied Oystercatcher) were not subject to assessment under Section 5A of the EP&A Act.

NPWS recommended that further assessment be undertaken of the potential impacts on these species by application of the 8 part test. NPWS also recommended that an assessment be undertaken of the cumulative effects of the proposal with respect to Council's proposal to dredge Tony's Bar which is another important habitat area. NPWS also commented that the effects of changes to the tidal regime on waterbirds within the lower estuary were unclear in the EIS.

The proponent undertook further assessment of the impacts of the proposal on waterbirds in response to NPWS's representation which was contained in the Representations Report. The assessment included 8 part tests for the following species as requested in NPWS representation:

- migratory waders at South Head Beach (7 species);
- resident waders (Sooty and Pied Oystercatcher) at South Head Beach;
- Ospreys at South Head Beach;
- Black-necked Storks at South Head Beach;
- Little Terns at South Head Beach (update of 8 part test undertaken in EIS); and
- resident and migratory waders inside the Lower Tweed Estuary.

The 8 part tests concluded that an SIS was not required. In the case of the Little Tern, the conclusion was reached on the basis that the following criteria were met:

- The permanent bypassing system was not established at the same time as the proposal at Tony's Bar by Council to undertake dredging.
- If a system involving fixed infrastructure with sand intakes located across the nearshore zone was selected as the preferred option, all infrastructure and any significant disturbance would need to be confined to within 1000m of the southern breakwater.
- If a system involving mobile land based systems which extract sand from beach, berm and immediate nearshore areas was selected as the preferred option, all such mobile infrastructure and any significant disturbance must be contained within 500m of the southern breakwater.
- A public education exercise should be implemented advising of the importance of South Head Beach as a habitat area for Little Terns.
- Suitable substrate is to be provided for the Little Tern nesting area south of the area influenced by the bypassing works.

A review of the additional work was undertaken by NPWS and it concluded that an SIS would not be required provided the following measures were included in the Conditions of Approval for the project:

- monitoring of any change in the tidal regime within the Tweed Estuary and a commitment to suspend operations should these changes become significant until the impact on migratory wading birds can be reassessed;
- location of disturbing infrastructure within either 500m or 1000m of the southern breakwater depending on which bypass option is chosen;

- enhancement of the roosting and nesting habitat for Little Terns on South Head Beach beyond the southern limit of bypass infrastructure. These works should be subject to approval by Local Aboriginal Land Council and undertaken in consultation with the NPWS Little Tern Recovery Team;
- implementation of a public relations program in conjunction with Tweed Shire Council highlighting the importance of the South Head Beach habitat for Little Terns; and
- scheduling of the works to limit disturbance to the winter months or to times when works are not being undertaken on nearby roosting sites such as Tony's Bar.

## 3. Review of Flora and Fauna Assessment by Department of Urban Affairs and Planning

The Department undertook a detailed assessment of the flora and fauna assessment presented in the EIS, the supplementary avifauna assessment and additional information provided by the proponent throughout the assessment process. The Department identified a number of issues that required further examination including general comments relating to the assessment methodology and findings and specific comments relating to impacts on avifauna and terrestrial flora and fauna on Letitia Spit.

As discussed above, the EIS undertook an assessment of the likely impacts of the proposal in terms of application of the 8-part test for one species of avifauna (the Little Tern). The supplementary work presented in the Representations Report provided further assessment but still focused solely on the impacts of the proposal on avifauna species. Further information was requested from the proponent that contained an examination of the NPWS databases to obtain a full list of threatened species occurring in the area, a detailed description of the habitats to be affected by the proposal (including vegetation and ecosystem maps) and subsequently, an estimate of the likelihood of any of the identified species occurring in the area being affected by the proposal. For those species which were considered unlikely to occur in the area, the Department requested that information be presented with regard to habitat requirements as to why those species were excluded from further assessment.

The Department indicated that for those species which have habitats that may be affected, targeted surveys may be required and for those threatened species located on site or known to potentially occur on site, the 8 part test should be undertaken in accordance with Section 5A of the Environmental Planning and Assessment Act 1979 to determine whether a significant effect is likely and therefore whether a Species Impact Statement is required.

In addition to these general comments, the Department had a number of specific concerns relating to the assessment of the impacts of the proposal on avifauna species. The following issues were identified by the Department:

- justification of the bird species to which the 8 part test was applied - whether it should be applied to birds who are likely to use the site as well as those which are known to use the site;
- information on the surveys undertaken to establish the bird populations;
- assessment of the functional role that South Head Beach plays in ensuring population viability of the different species;
- justification for undertaking group 8-part tests for waders;
- revision of 8 part test for Little Tern in relation to the significance of impacts; and
- require verification if the Little Tern or Pied Oystercatcher nest in the lower Tweed Estuary and the likely impacts on nesting as a result of tidal range changes.

The Department also raised a number of concerns about the adequacy of the assessment undertaken relating to the terrestrial ecological environment in the study area, specifically in relation to Letitia Spit. Further information was requested from the proponent in relation to the vegetation communities on Letitia Spit and the presence of a range of threatened species that possibly occurred in the area including the Wallum Froglet, Long Nosed Potoroo, Queensland Blossom Bat and the following flora species: *Cryptocarya foetida*; *Syzigium moorei*; *Randia moorei;* and *Acronychia littoralis.* Further information was also sought relating to the extent of the infrastructure that would be required on Letitia Spit for various options.

Further information was provided by the proponent in response to the comments by the Department. The proponent indicated that it had determined the only threatened species that were known to be present, or which were likely to be present, on intertidal sand and mudflats and exposed coastal beach habitats within the vicinity of the Tweed River mouth and South Head Beach were all bird species as follows:

- Sooty and Pied Osytercatchers (resident wader species)
- Beach Stone Curlew
- Lesser Sand Plover
- Greater Sand Plover
- Black Tailed Godwit
- Terek Sandpiper
- Sanderling
- Great Knot
- Little Tern
- Black Necked Stork
- Osprey

Eight part tests had been undertaken for these species in the supplementary report, based on the results of extensive survey work undertaken in the region in relation to the use of the area by resident and migratory avifauna species. The proponent stated that the results of these studies, which included 12 months of studies undertaken specifically for the bypassing works, strongly supported the view presented regarding the importance of South Head Beach as roosting and feeding habitat. The conclusions of the 8 part tests were that, provided the proposed mitigation measures were implemented as part of the proposed works, the proposal would be unlikely to have a

significant effect on these species and therefore, no Species Impact Statements would be required.

In relation to the issue of impacts on the Little Tern and Pied Oystercatcher as a result of changes to the tidal regime, additional information provided by the proponent indicated that the potential for these species to nest within the Tweed estuary was very low and there were no records of this occurring, and as such any negligible changes to the tidal regime would be unlikely to affect the nesting habits of these species.

In response to the specific comments made by the Department in relation to the 8 part tests contained in the supplementary report, the proponent indicated that there was no justification for undertaking separate 8 part tests for each of the wading species as this was unlikely to reveal any additional information. A review which was undertaken of the 8 part test presented for the osprey supported the conclusion that there were unlikely to be impacts on this species as a result of the works. In addition, the previous conclusions of the 8 part test in relation to Little Terns were supported by the proponent. The Department concurs with the conclusions reached in relation to these issues. However, it is considered that a management plan for Little Terns should be developed prior to commencement of construction works on site.

In relation to the selection of the species to be assessed, the Department also requested further information relating to species other than avifauna species as discussed above. To address this issue, the proponent undertook a search of the NPWS database covering an area of radius 10km from the Tweed River mouth. This search revealed 25 additional flora and fauna species in the region for which 8 part tests had not been previously undertaken. The proponent presented an assessment of these 25 species which examined the likely habitat requirements of each species, the likelihood that each species would occur in the study area and the potential that the species, should it be present, would be impacted by the works. The assessment concluded that none of the additional 25 species would be adversely impacted by the works.

The Department concurred with this assessment for the majority of the species identified. However, further information was sought particularly in relation to a number of species that were identified as potentially occurring within the terrestrial areas of Letitia Spit.

To address these further concerns detailed survey work was undertaken by the proponent in the area of Letitia Spit. The survey identified nine specific vegetation types as follows:

- front dune vegetation
- beach ridge vegetation
- coast she-oak vegetation
- swamp she-oak vegetation
- paperbark low open forest
- coast banksia low open forest
- open cleared areas
- coastal wattle open scrub

- mangroves

The results of the survey also indicated that much of the site contained a dense layer of bitou bush in the understorey and ground layers. No threatened flora species were identified during the survey including the four littoral rainforest flora species that the Department requested to be targeted.

The fauna survey found no evidence of the three species that the Department requested to be targeted. It was concluded that of these species, the Long Nosed Potoroo was unlikely to occur on the site, the Queensland Blossom Bat may use northern portions of the site for feeding but would be unlikely to be disturbed by the proposed works and the Wallum Froglet was unlikely to be present on the site.

However, the survey did identify the Black Flying Fox which is a threatened species under the TSC Act feeding on the site. An 8 part test undertaken for this species concluded that none of the potential bypass works would affect populations of this species as it does not roost or breed in the area. The possible removal of a small amount of the food source for this species was seen to be an insignificant impact.

In relation to the other issues raised by the Department, it was concluded that there would be unlikely to be any impact on the three bat species identified by the Department, namely Becarris Freetail Bat, Little Bent Wing Bat and Easter Long Eared Bat.

In addition, the report concluded that there would be unlikely to be any impact on the Green Turtle as this species is not known to nest within the Tweed region.

## 4. Conclusion

The Department concurs with the conclusions reached by the proponent and agrees that the proposed works, including the proposed mitigation measures, are unlikely to have a significant effect on any threatened species as defined in the TSC Act 1995. The proposed mitigation measures have been incorporated in the Recommended Conditions of Consent for the proposal (refer Recommended Conditions of Approval 39 to 42).